

## INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

**The quality of this reproduction is dependent upon the quality of the copy submitted.** Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

ProQuest Information and Learning  
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA  
800-521-0600

UMI<sup>®</sup>



ESTABLISHING COLLABORATIVE STRUCTURES AND RELATIONSHIPS:  
TEACHER LEADERS' EXPERIENCES

by

Thea Lynne Cañizo

---

A Dissertation Submitted to the Faculty of the  
DEPARTMENT OF EDUCATIONAL LEADERSHIP

In Partial Fulfillment of the Requirements  
For the Degree of

DOCTOR OF EDUCATION

In the Graduate College  
THE UNIVERSITY OF ARIZONA

2 0 0 2

UMI Number: 3073204

UMI<sup>®</sup>

---

UMI Microform 3073204

Copyright 2003 by ProQuest Information and Learning Company.  
All rights reserved. This microform edition is protected against  
unauthorized copying under Title 17, United States Code.

---

ProQuest Information and Learning Company  
300 North Zeeb Road  
P.O. Box 1346  
Ann Arbor, MI 48106-1346

THE UNIVERSITY OF ARIZONA ©  
GRADUATE COLLEGE

As members of the Final Examination Committee, we certify that we have read the dissertation prepared by THEA LYNNE CANIZO

entitled ESTABLISHING COLLABORATIVE STRUCTURES AND RELATIONSHIPS:  
TEACHER LEADERS' EXPERIENCES

and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of DOCTOR OF EDUCATION

David M. Quinn  
DAVID M. QUINN, Ph.D.

11/6/02  
Date

Kris Bosworth  
KRIS BOSWORTH, Ph.D.

11/6/02  
Date

Robert Hendricks  
J. ROBERT HENDRICKS, Ed.D.

11/6/02  
Date

Larry A. Lebofsky  
LARRY A. LEBOSKY, Ph.D.

11/6/02  
Date

Donald W. McCarthy Jr.  
DONALD W. MCCARTHY, Ph.D.

11/6/02  
Date

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

David M. Quinn  
Dissertation Director  
DAVID M. QUINN, Ph.D.

11/27/02  
Date

## STATEMENT BY AUTHOR

This dissertation has been submitted in partial fulfillment of requirements for an advanced degree at The University of Arizona and is deposited in the University Library to be made available to borrowers under the rules of the library.

Brief quotations from this dissertation are allowable without special permission, provided that accurate acknowledgement of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the head of the major department or the Dean of the Graduate College when in his or her judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

SIGNED:

Thea L. Canino

## ACKNOWLEDGEMENTS

I wish to acknowledge the many friends, colleagues, and family members whose help and encouragement enabled me to complete this study. I was fortunate to have an exceptionally supportive committee. In particular, my advisor, David Quinn, provided invaluable guidance, assistance, and good cheer throughout the process. I am deeply indebted to Kris Bosworth for her generous and wise help in the design and conduct of the study. Bob Hendricks has been an integral and important part of my experiences in the Educational Leadership program for the past five years. My minor committee members, Larry Lebofsky and Don McCarthy, with Nancy Lebofsky, started me on the road to teacher leadership many years ago, and I am very grateful for their support of teachers and education and their friendship to me.

I am very appreciative of the leadership and efforts of Don Clark and Stephanie Parker during the first two years of my participation in the department.

Barry Roth was my sounding board and triangulator. I salute his knowledge and his ready willingness to share this with others. Along with Barry, my colleagues at the Science Resource Center--Gail Paulin, Alice Bever, Joel Blutfield, Sharyn Chesser, Marleen Kotelman, and the elementary collaborative teachers--have been a source of strength to me and to the many teachers who have learned from them. Their visionary leadership in science education reform provides an exemplary model of how educational change can be brought about.

I admire immensely all the teacher leaders who participated in this study and all the others with whom I work. Their love of children, of learning, and of teaching gives me hope and comfort. I thank them for everything they do so well.

Finally, to my family, Mom, Laura and Larry, Susie and Luke, and those in New Jersey and Mexico, I give my thanks for their love, support, and constant caring. I could not have accomplished this without them.

## DEDICATION

This work is dedicated to the memory of my husband,  
Sergio Cañizo Vásquez,  
Mexican educator and American journalist,  
1940 - 2001

## TABLE OF CONTENTS

LIST OF TABLES. . . . .	10
ABSTRACT. . . . .	11
1. INTRODUCTION TO THE STUDY. . . . .	13
Background of the Study. . . . .	15
Problem Statement. . . . .	21
Professional Significance of the Study . . . . .	22
Overview of Methodology. . . . .	23
Research Questions. . . . .	25
Assumptions. . . . .	25
Delimitations. . . . .	26
Definition of Terms. . . . .	27
Organization of the Study. . . . .	29
2. REVIEW OF THE LITERATURE . . . . .	31
Introduction . . . . .	31
School Change. . . . .	32
Rationale for Changing Schools. . . . .	32
Reform and Reforming Again. . . . .	33
Systemic Change . . . . .	37
Sustainability of Change. . . . .	39
Section Summary . . . . .	46
School Culture . . . . .	48
Organizational Culture. . . . .	49
The Culture of Schools. . . . .	53
The Effects of School Culture on Change Efforts. . . . .	57
The Factors of School Culture . . . . .	60
Section Summary . . . . .	61
Teacher Collaboration. . . . .	62
Studies of Collaboration. . . . .	63
Recent Studies of Collaboration . . . . .	68
Section Summary . . . . .	74
Teacher Leadership . . . . .	75
Historical Perspectives of Leadership . . . . .	75
Extending Leadership to Teachers. . . . .	83
Justification for Teacher Leadership. . . . .	85
Parameters of Teacher Leadership. . . . .	86
Developing Leadership Skills in Teachers. . . . .	88
Constraints on Teacher Leadership . . . . .	90
Experiences of Teacher Leaders. . . . .	92
Section Summary . . . . .	96
Teacher Empowerment. . . . .	97
Section Summary . . . . .	105
Summary of the Literature. . . . .	106

## TABLE OF CONTENTS--Continued.

3. METHODOLOGY. . . . .	.109
The General Perspective. . . . .	.109
The Research Context . . . . .	.111
Additional Influences During the Year of the Study .	.117
The Researcher's Role. . . . .	.118
The Research Participants. . . . .	.120
Procedures Used. . . . .	.126
Data Analysis. . . . .	.130
Summary of the Methodology . . . . .	.134
4. RESULTS OF THE STUDY . . . . .	.135
Introduction . . . . .	.136
The Participants in the Study. . . . .	.136
Karen . . . . .	.136
Margie. . . . .	.137
Jim . . . . .	.138
Carla . . . . .	.140
Linda . . . . .	.141
Marianne. . . . .	.142
JoAnne. . . . .	.144
Patty . . . . .	.145
What Factors Do Teachers Identify as Contributing to Their Success as Leaders?. . . . .	.147
Support from the Principal. . . . .	.147
Support from Other Science Teachers on Staff. .	.150
Support from Central Staff. . . . .	.151
Support from Other Middle School Science Teachers . . . . .	.152
Professional Development. . . . .	.153
Scope and Sequence. . . . .	.157
What Factors Do Teachers Identify as Standing in the Way of Their Success as Leaders? . . . .	.159
Lack of Support/Conflict with the Principal .	.159
Resistance to Change. . . . .	.161
Time. . . . .	.163
District Policies . . . . .	.163
Turnover. . . . .	.165
The Middle School Model: Grade Level Team or Subject Area Department? . . . . .	.167
Personal Doubts . . . . .	.168
Is There Evidence of the Empowerment of Teacher Leaders? If So, How Do They Express That Empowerment?. . . . .	.169

## TABLE OF CONTENTS--Continued.

Participants' Understanding of Leadership . . .	.169
How They Lead . . . . .	.170
The Circumstances in Which They Felt Like Leaders. . . . .	.172
Personal and Professional Goals . . . . .	.174
Other Leadership Roles They Hold. . . . .	.175
What Effect Does the School Culture Have on Efforts to Change Science Teaching and Learning?. . . .	.176
Collaborative Leadership. . . . .	.177
Teacher Collaboration . . . . .	.178
Professional Development. . . . .	.179
Collegial Support . . . . .	.180
Unity of Purpose. . . . .	.181
Learning Partnership. . . . .	.182
How Are Collaborative Structures and Relationships Established at a School?. . . . .	.185
Collaborative Structures. . . . .	.186
Collaborative Relationships . . . . .	.188
How Do Collaborative Structures and Relationships Become Sustained Over Time? . . . . .	.191
School Level. . . . .	.191
Central Level . . . . .	.193
Chapter Summary. . . . .	.195
5. SUMMARY AND DISCUSSION . . . . .	.196
Statement of the Problem . . . . .	.196
Review of the Methodology. . . . .	.197
Summary of the Results . . . . .	.197
Factors Which Contribute to Teacher Leaders' Success. . . . .	.198
Factors Which Stand in the Way of Teacher Leaders' Success . . . . .	.199
The Empowerment of Teacher Leaders. . . . .	.202
The Effect of School Culture on Teacher Leaders. . . . .	.203
Establishing Collaborative Structures and Relationships at a School. . . . .	.205
Sustaining Changes Made in Collaborative Structures and Relationships . . . . .	.207
Analysis/Discussion of the Results . . . . .	.208
Interpretation of the Findings and Relationship of the Study to Previous Research . . . . .	.208
Recommendations to Educators. . . . .	.218
Suggestions for Additional Research. . . . .	.221

TABLE OF CONTENTS—*Continued.*

APPENDIX A	CHARACTERISTICS OF EFFECTIVE SCIENCE FACILITATORS. . . . .	.224
APPENDIX B	INTERVIEW PROTOCOL. . . . .	.225
APPENDIX C	HUMAN SUBJECTS APPROVAL . . . . .	.229
APPENDIX D	SCHOOL DISTRICT APPROVAL. . . . .	.230
REFERENCES.	. . . . .	.231

## LIST OF TABLES

Table 1, Some Factors Which Support Sustainability of Change Efforts at Individual, School, and District Levels . . . . .	47
Table 2, Science Facilitators' Rankings and Sampling of Study Facilitators . . . . .	123

## ABSTRACT

The purpose of this study was to explore teacher leaders' experiences as they attempted to establish collaborative structures and relationships resulting in improved science instruction at their schools. Teacher leaders were middle school science facilitators, full-time classroom teachers who acted as liaisons between the science teachers at their schools and a change initiative funded by the National Science Foundation.

This was a qualitative study, using interviews to create a case study. The researcher used a three-part interview design developed by Seidman (1991). Six research questions served as a framework for the data analysis.

Participants identified the following as factors which contributed to their success: support from the principal, other science teachers, central staff personnel, and the district-wide group of science facilitators; professional development; and the successful completion of a scope and sequence for science instruction.

Factors identified as hindering their success were: lack of support or conflict with the principal; resistance to change; time constraints; a district policy which limited meeting time; teacher and administrator turnover; tension between the middle school and junior high school models; and personal doubts.

From descriptions of their understanding and exercising of leadership, the researcher concluded that teacher leaders had become empowered.

The school culture was seen to have a great effect on teacher leaders. The contrasts between a school with a positive culture and another school in disarray were presented.

Structures such as summer institutes and release time during the school day were identified as critical for giving teachers the time needed to establish more collaborative working relationships. Once greater trust and understanding were present, teachers were better able to examine their teaching practices more critically.

Participants identified mentoring of new members, a continuing role for science facilitators, and central support as necessary for ensuring the sustainability of the changes made during the years of the grant initiative.

The researcher concluded that teacher leaders can be a powerful force for bringing about change in schools when provided with training and time during the school day to work with colleagues.

## CHAPTER 1

## INTRODUCTION TO THE STUDY

The educational system in the United States has been the focus of great interest and increasing criticism for the past several decades. Indeed, Sarason (1982) refers to the changing and improvement of schools as "one of the major industries" (p. 3) of the post-World War II era. Today, both critics and supporters of public education, along with members of the teaching profession, agree on the need for comprehensive changes in school programs so that students are better prepared to succeed in the workplace, their personal lives, and in society.

Many educational reviewers (Barth, 1990; Katzenmeyer & Moller, 1996; Lambert, 1998; Senge, Kleiner, Roberts, Ross, Roth, & Smith, 1999) propose that schools can become more responsive to the learning needs of children by giving teachers power over decisions directly affecting the classroom; the traditional hierarchy of roles and relationships in school systems, with mandates being imposed upon teachers from those in positions above them, would be flattened. These writers suggest that classroom teachers are those best able to study their practice, try out innovations, and evaluate the impact of these new approaches on students' learning.

The Carnegie Report (1986), "A Nation Prepared: Teachers for the 21st Century," emphasized the need for teachers to become actively involved in the school change process. The Report encouraged the development of teacher leadership (Wasley, 1991). The role of teachers as leaders could take several forms: participation in school governance; leadership of grade-level or interdisciplinary teams; positions in mentoring programs; and participation in action research groups, the disciplined inquiry into classroom practice wherein teachers become researchers of their own work with students (Glanz, 1998; Hubbard & Power, 1993).

The term "teacher empowerment" came into frequent use during the 1990s. It refers to shifts in traditional patterns of authority in schools (Short & Greer, 1997). Teachers were to be given the power to make decisions regarding curriculum, instruction, assessment, and governance hitherto belonging only to administrators. Lightfoot (1986) states that empowerment provides autonomy, choice, and responsibility to the teacher.

During the same time period, organizational theorists proposed new models of organizational leadership which support the ideas of teacher leadership and empowerment. Senge (1990) and Wheatley (1994) believe that positive changes in organizations can be best brought about by the

increased participation of all stakeholders. They suggest that traditional bureaucratic hierarchies of authority do not permit the flexibility needed to respond to demands for change and improvement. Decision-making is more effective if done at local levels because those closest to a problem are the ones best equipped to remedy it; they know the problem best.

The purpose of this study was to explore teacher leaders' experiences as they attempted to establish collaborative structures and relationships which would result in improved science instruction at their schools. Teacher leaders in the study were middle school science facilitators, full-time classroom science teachers. These teachers took on the additional role of acting as liaisons between the science teachers at their school and a local systemic change project funded by the National Science Foundation. There is one science facilitator at each of the 19 middle schools in a large urban Southwestern school district.

### *Background of the Study*

Amidst general calls for the reform of schooling in the United States, there have been waves of reform efforts directed toward science education in particular. The National Science Foundation, established in 1950 to support

science education and research at the graduate school level, extended its support to precollege programs during the 1960s. This widening of the Foundation's sphere of interest occurred because university scientists became concerned at the declining numbers of college students working toward degrees in the sciences and engineering. Summer institutes for science teachers were held; the Foundation also provided funds for the development of curricular materials written by leading physicists and biologists. Researchers (Raizen, 1992; Yee & Kirst, 1994) have stated that while the quality of the professional development programs for teachers was very high and the curricular materials created at the time were very good, the result of those efforts was that the teachers most in need of the additional training did not receive it, and the curricular materials developed were not usable by most of the teachers in the schools.

By the early 1990s a different view of science education reform was taking shape. With the publication of *Science for All Americans* (1990) and the *National Science Education Standards* (1996), a new emphasis was placed on giving all children a good preparation in science. No longer solely intent on the preparation of college-bound students of the sciences, there was a call for inquiry-based science instruction for all children, beginning in kindergarten and continuing through elementary, middle, and high school. The

twin goals of the Standards were excellence in K-12 science education and equity for all students, including the traditionally underserved. The framers of this reform effort proposed to create a more scientifically literate work force and citizenry with the purpose of increasing economic productivity and for better-informed decision-making on the part of citizen voters.

The new emphasis on science education for all meant that greater numbers of teachers needed additional preparation in the methods and content of science, especially at the elementary and middle levels. To meet this need, the National Science Foundation began funding systemic change initiatives for urban and rural districts, at local or state-wide levels. The focus on system-wide change came about because policy makers believed earlier reform efforts had failed precisely because only specific and isolated components of the educational system had been targeted, such as curriculum, teacher preparation, instruction, or assessment, rather than addressing change in the entire system within the parameters of an all-encompassing plan (Knapp, 1997). The new systemic programs were designed to give elementary and middle school teachers greater science content knowledge, a better understanding of how the processes of science are carried out, and more effective

pedagogical practices through constructivist, inquiry-based science instruction.

An important component of the grant programs was the focus on creating sustainable change: when the grant monies were gone, there had to be structures, practices, and relationships in place at school sites which would allow the innovations to continue rather than be dropped; these would ensure that teachers would not revert to previous patterns of behavior.

It was believed that one way to foster sustainability was to promote greater degrees of interaction and collaboration among teachers in the schools. Together they could analyze needs, observe each other at work, propose ways to improve instruction, and assess the changes made. The collaborative relationships forged during the years of the grant programs would allow the changes in practice to take hold and endure over time.

This vision of the power of collaborative work arose in part from Senge's (1990) theory of the learning organization, part of his systems thinking framework. In a learning organization, as individual members learn and change their attitudes and behaviors, there are also structures created which allow for ongoing change to occur. The organization thus builds its own capacity to learn and change. This makes the organization more responsive to

environmental pressures and ultimately, much more successful.

The work of Leithwood, Dart, Jantzi, & Steinbach (1994) on organizational learning and Barth's (1990) work on learning communities relate Senge's model to the school setting. Organizational learning is greater than the sum of the individual learning of all members; the organization develops its own cognitive system wherein knowledge and information are stored and can be drawn from. For this pooling of knowledge to occur, individuals must be able to learn from each other through joint work. For Barth, a school must be a learning community for adults as well as for children.

An illustration of the effects of collaboration in the school is set forth in Rosenholtz's (1991) study of Tennessee schools. The study demonstrated the relationship between teacher isolation and lower student achievement in what she termed "stuck" schools, compared to the positive effects of teacher collaboration and increased student learning in "moving" schools. The moving schools were sites wherein the joint efforts of teachers resulted in the discovery of more effective ways of helping students learn. With a clear consensus on the goals of the organization and with increased understanding of methods and teaching practices which are successful in helping students progress,

the teachers in the collaborative sites left behind the isolationism and uncertainty typical of the stuck schools.

What can account for differences in schools' capacity for collaborative work by teachers? Several authors (Leithwood, Aitken, & Jantzi, 2001; Maehr & Midgley, 1996; Rosenholtz, 1991; Sarason, 1982) believe the concept of organizational culture can help in part to explain the success or failure of attempts to create collaborative learning communities in schools. Schein (1992) defines culture as "a pattern of shared basic assumptions . . . the correct way to perceive, think, and feel" (p. 12). Culture exists on three levels: as artifacts, the visible organizational structures and processes; as espoused values, the philosophies and goals expressed orally and in writing; and as underlying assumptions, the unconscious, taken for granted values which are the source of all beliefs and actions of the organization. For teachers to be able to collaborate successfully then, the deep-seated cultural assumptions that exist at each school would have to support the interaction and joint work of teachers.

The effect of the school culture on change efforts can be great. In a review of the science curriculum reform programs of the 1960s and '70s, Heckman (1993) writes that although teachers agreed to use the new materials and methodologies, and although both teachers and administrators

reported that they were in use, in reality there was little distinction between traditional classroom practices and the supposedly new ones. Teachers did not actually change what they taught or how.

The lesson would seem to be that the unwritten norms and regularities of classroom and school life (the culture of school) transcend the written rules, regulations, and alternative ideas of the most ambitious and innovative administrators, policymakers, and curriculum developers. (p. 265)

#### *Problem Statement*

Historically, the norm in educational systems has been that schools and teaching are organized around the idea of teacher individualism and separation (Lortie, 1975). One teacher is responsible for his or her classroom, a group of students, or subject matter; interruptions and incursions by others into the classroom are generally undesirable. Lortie refers to this as "boundedness" (pp. 169-171).

In the context of the local systemic grant of this study, then, for changes in teaching and learning to occur and be sustained over time, the bounded nature of teachers' working lives would have to change. Teachers would have to communicate, interact, and plan together to a greater extent than previously; cultural assumptions of autonomy and independence that might exist in the schools would be challenged. Acting as science facilitator, one of the teacher leader's primary tasks would be to guide efforts to

establish a collaborative learning community among the members of the science staff.

This study explored teacher leaders' experiences as they attempted to establish collaborative structures and relationships which would result in improved science instruction at their schools.

#### *Professional Significance of the Study*

This study contributes to the literature on school change efforts with its description of the experiences of teacher leaders in the context of a federally-funded program designed to improve instruction and learning. It focuses specifically on the role of teacher leaders in helping to create and sustain change in teaching practices in science classrooms through increased collaboration among science teachers.

By attempting to determine what factors teacher leaders identify as important to their ability to bring about changes in teacher interactions and relationships, this study helps clarify the process through which teachers can become leaders. It also contributes additional information to the literature on teacher empowerment.

If the professional life of teachers can be enhanced through teacher leadership processes, the profession will be

able to recruit more capable future teachers and retain them for the long-term.

### *Overview of Methodology*

This study employed a qualitative perspective to explore and understand participants' experiences in a school change effort and the meanings they attach to those experiences. By uncovering patterns and themes in teacher leaders' descriptions of their work with other teachers, the study attempted to identify the critical variables which affect the success or failure of efforts to build collaboration among school staff members.

The type of research employed was the case study. Yin (1989) writes that the case study is an "empirical inquiry that investigates a contemporary phenomenon within a real life context" (p. 23). Glatthorn characterizes the case study as providing "a detailed description of a particular situation, organization, individual, or event . . . a disciplined inquiry concerned with illuminating meaning by using inductive processes" (p. 76). In this study, the individual experiences of several teacher leaders were "layered or nested within an overall primary case approach," as described by Patton (1990, p. 298).

The context of the study was a large Southwestern school district which is in the final year of a National

Science Foundation local systemic initiative grant to improve science instruction in grades K through 8. The participants are middle school science facilitators; they are the site leaders for the science staff of each school.

The researcher gathered teacher leaders' stories through in-depth, phenomenological interviewing, as described by Seidman (1991). There are three parts to the interview process Seidman has developed. The first establishes the context of the participant's current experience through descriptions of the person's past, a type of life history focused on how the person arrived at his or her present position. The second part asks participants to recount in detail their present experiences around the topic of study. In the third phase of this process, the interviewer elicits participants' reflections about past and present and the meanings they have constructed about those experiences.

The interview questions were generally open-ended. The interview protocol consisted of a series of open-ended questions with probes; the probes served as a guide to the interviewer.

The analysis of data followed the guidelines set by Patton (2002): through an inductive process, patterns and themes are discovered from the data; these are established as categories or classifications; the data sources are re-

examined and organized into the categories; through convergence, the analyst decides which pieces of data fit together; through divergence, the analyst seeks to extend the data by making connections among categories; and finally, the researcher presents the findings and conclusions.

### *Research Questions*

1. What factors do teachers identify as contributing to their success as leaders?
2. What factors do teachers identify as standing in the way of their success as leaders?
3. Is there evidence of empowerment of the teacher leaders? If so, how do they express that empowerment?
4. What effect does the school culture have on teacher leaders' efforts to change science teaching and learning?
5. How are collaborative structures and relationships established at a school?
6. How do collaborative structures and relationships become sustained over time?

### *Assumptions*

The following assumptions were held for the study:

1. The 19 science facilitators actually are teacher leaders.
2. Teacher leaders who are interviewed will respond honestly and completely to questions.

### *Delimitations*

The following circumstances describe the boundaries of the study and affect the generalizability of the results found:

1. Only middle schools are included in the study.
2. The schools described in the study are participating in a local system initiative grant for teacher enhancement, funded by the National Science Foundation.
3. The schools in the study either applied to participate in the grant program or were directed to participate by central office administrators.
4. Some of the teacher leaders who participated in the study had been science facilitators for a longer period of time than had others.
5. The treatment received by the schools through participation in the local systemic grant program is very similar, but not identical.
6. At the time of the study, the schools will have been participating in the grant program for

different lengths of time; however, the role of science facilitator has existed in all schools for the same length of time.

7. Participants' perceptions may be influenced by their inclusion in the study (the Hawthorne effect).
8. As a member of the central team providing the professional development offered by the SER Project, the researcher's perceptions and interpretations of the study results may be subject to bias.
9. Teacher leaders interviewed for the study may have been influenced by their awareness of the researcher's role and position in the district's science resource department.

#### *Definition of Terms*

Cohort Schools. All the elementary and middle schools in the school district are organized into cohorts of approximately 20 schools per cohort. The cohort schools receive intensive treatment for two summers during Summer Institutes and during one school year. During the second school year, the treatment is less intensive with responsibility for continued professional development

falling more heavily onto the individual site and its leaders.

Collaborative Teacher. Former classroom teachers who work for the grant project. There are two collaborative teachers who will work with the 19 middle schools over the life of the grant.

Empowerment. Rinehart & Short (1994) define this in the educational setting as "teacher involvement in educational decision making" (p. 2). Teachers are given the opportunity to participate in problem solving, generally in the areas of governance, curriculum, instruction, and assessment.

Learning Forums. During the cohort's first year in the grant, the collaborative teachers work with all science teachers on staff during a morning or afternoon. Each school has six or seven learning forums over the course of a year. Among the topics addressed are: effective science instruction, science curriculum, and assessment of student learning.

Science Facilitator. The science facilitator is a full-time teacher who works as liaison between the grant program and his/her school site. The facilitator is usually chosen by members of the science staff and the principal. During the first two years of the grant, facilitators received a stipend; subsequently, they received salary increment credit. Their responsibilities include: attendance at

professional development sessions for facilitators; communication of information between grant personnel and site science teachers; communication with the school principal; planning for the continued professional development of science teachers; and other responsibilities depending on the site.

Summer Institutes. Each cohort school's team of science teachers and administrator attends a four-day Summer Institute during two consecutive summers.

Teacher Leader. For purposes of this study, teacher leaders are those who continue to work full-time in the classroom, but also take a leadership role in efforts to advance the profession and improve student and teacher learning through interactions with their peers in activities such as mentoring, peer coaching, and the design and presentation of professional development. Teacher leaders in this study are the middle school science facilitators whose role is described above.

### *Organization of the Study*

Chapter 1 is an introduction to the study and provides information on the background of the study topic, the problem statement, the professional significance of the work, an overview of the methodology, the research questions, assumptions and delimitations, and a definition

of terms. The review of literature in Chapter 2 has the following sections: school change: systemic change and the sustainability of reforms; the culture of organizations and of schools in particular; collaboration in schools; and teacher leadership; and teacher empowerment. Both theory and the results of empirical studies on these topics are presented.

Chapter 3 presents information on the research design and methodology. In Chapter 4, the results of the study are presented. The concluding chapter, Chapter 5, contains an analysis and summary of the investigation and the conclusions reached. It also has a discussion of the implications for the field raised by the study and suggestions for areas in which further study will be productive.

## CHAPTER 2

## REVIEW OF THE LITERATURE

*Introduction*

This chapter provides a context for understanding the factors which affect the teacher leaders in this study as they work toward establishing collaborative structures and relationships in their schools. The main topics are:

- School change. This section presents information on the history of the most recent reform movement, including a discussion of systemic reform and the sustainability of reforms.
- School culture. The concept of school culture and its effects on teaching and learning are described.
- Teacher collaboration. This section describes how norms of independence and isolation in the profession have developed and how those norms are seen as hindering the improvement of teachers' work.
- Teacher leadership. This section reviews the teacher leadership movement.
- Teacher empowerment. This section defines and describes studies on the empowerment of teachers.

Each section begins with theories and explanations of the topic, presented in chronological order so that the evolution of thought and professional wisdom is shown. Findings of empirical studies follow. Each section has a

summary statement; the chapter concludes with a final summary which draws together the themes presented.

### *School Change*

Numerous national reports produced within the past four decades draw attention to the need for changing the educational system in the United States. The *Equality of Educational Opportunity* study (Coleman, 1966), *A Nation at Risk*, (National Commission on Excellence in Education, 1983), the Carnegie Forum on Education and the Economy's *A Nation Prepared: Teachers for the 21st Century*, published in 1986, *A Time for Results* (National Governors' Association, 1986), and the U.S. Department of Education's *America 2000: An Education Strategy* (1991) are just some of the reports which all declare the urgent need to reform public schools. Why is change needed?

*Rationale for changing schools.* Educational theorists support the calls for change and offer explanations for why they have come about. Fullan and Stiegelbauer (1991) explain that there is a dual purpose to schooling: the cognitive/academic purpose and the personal/social development aspect. As a society grows in complexity and pluralism increases, the school must respond to its changing

environments; the definition of the parameters of the two purposes becomes increasingly difficult.

Darling-Hammond (1997) states that in the past the goals of schooling were a minimal mastery of basic skills and the socialization of the citizenry to the American way of life. Currently, however, schools must teach for understanding rather than rote and for the acceptance of diversity in society rather than homogeneity.

Children must be educated to achieve functional literacy, going well beyond basic literacy (Schlechty, 1997). This means that learners must be good problem-solvers with the ability to analyze, summarize, and synthesize information. In terms of the whole society, "It is no longer enough to have a relative few who are well-educated. Today most must be well-educated" (p. 12).

Writing about school reform in the context of political forces, Loup and Blase (1999) state that reform efforts at the national and state level are enacted with the purposes of keeping the country's economy strong and maintaining the United States' role as a world power. The schools' charge now is to prepare a highly educated work force to ensure the nation's continued economic and political preeminence in the light of rapid technological advances.

Although there is general agreement on the need to change what the schools do and how they do it, a review of

the history of the reform efforts of the past four decades shows the difficulty of accomplishing broad, effective, and long-lasting change.

*Reform and reforming again.* Authors have described why reform efforts have been difficult to put into practice and why there are reoccurring waves of reform movements. Reviewing the history of reform efforts in the latter half of the 20th century, Fullan and Stiegelbauer (1991) identify four phases: the adoption era in the 1960s, when schools introduced many innovations in mathematics and science curriculum and teaching methodologies as a response to pressures brought to bear in the wake of the Soviet success with Sputnik; the implementation era of the early to mid-'70s, when critics found a lack of planning and follow-through in the innovations; the late 1970s when researchers were able to identify some successful programs and practices being implemented; and then the latter half of the 1980s in which national reports began to demand a more comprehensive and thorough approach to change efforts.

The comprehensive reform movement of the 1980s continues today. Fullan and Stiegelbauer (1991) have found two distinct approaches to it. They call one approach "intensification". This refers to demands for more highly defined curricula, textbook reform, changes in instructional

methodologies, standardized testing requirements, and increased monitoring and evaluation of programs. The other approach is termed "restructuring"; this entails changes in school structure and governance, examples being school-based management, new roles for teachers, and changes in school schedules to allow for collaboration.

Cuban (1990a) makes the same distinction between reform approaches. He refers to them as first- and second-order changes. In a first-order change, the emphasis is on improving programs and practices already existing. "First-order changes try to make what already exists more efficient and more effective, without disturbing the basic organizational features, without substantially altering the ways in which adults and children perform their roles" (p. 73). A second-order change involves making deep changes in roles and structures; "Each of these reforms attempts fundamentally to alter existing authority, roles, and uses of time and space" (p. 73). Cuban believes most reform efforts have been first-order changes and that second-order reforms, when attempted, have generally not been successful. The author offers the cautionary statement that "Change is not necessarily improvement" (p. 72).

Cuban (1990b) also views the recurring calls for school reform as a mechanism for maintaining the social order. When differences in values emerge and come to the forefront in

society, the schools are asked to address these issues of national concern because they can work to improve conditions slowly over time "without danger of upheaval". (p. 8) A more direct and immediate approach to solving social issues is deemed too risky by dominant social groups; thus the school becomes "a tool of reform for social problems" (p. 8).

Reform efforts are imposed on schools without the participation of stakeholders (Loup & Blase, 1999). They state that "most major educational reform movements in the United States have been short-lived political endeavors initiated by forces external to schools; this has left the larger educational context only slightly altered and has produced negligible changes in schools" (p. 40).

In a similar vein, Darling-Hammond (1997) refers to the faddishness of new plans and strategies to improve. "Schools are usually asked to adopt these fads as single ideas laid on top of old structures. Such ideas are poorly assimilated and quickly rejected" (p. 22).

The above authors coincide in their depiction of the old structures of schooling which persist and always seem to master attempts to change them, especially when those attempts are merely cosmetic. Rather than surface changes, the structures, roles and relationships in the schools have to be profoundly altered. This is what Fullan and Stiegelbauer (1991) call restructuring and what Cuban (1988)

refers to as second-order changes. "Systemic change" is a term which many authors use to delineate a way to achieve fundamental and comprehensive changes in schools.

*Systemic change.* There are several definitions of systemic change. Smith and O'Day (1991) view it as a balanced combination of state mandates and local school site governance. The state sets a unifying vision and goals, a curricular framework, and funds professional development of teachers. The state also monitors and evaluates programs. The local school site has greater powers in governing itself and is in charge of implementing curriculum and instruction.

Previous reform efforts targeted separate facets of the educational system (curriculum, instruction, teacher preparation, professional development, assessment, graduation requirements, school governance, school climate and ethos), according to Knapp (1997); because of the uneven results produced by these efforts, policymakers decided that all facets should be addressed at the same time. The author states that systemic reform has also been referred to as alignment, coherent policies, and standards-based reform.

Schlechty (1997) makes a distinction among three types of change: procedural change (the way a job is carried out); technological change (the means of doing the job are changed); and systemic change, also called structural and

cultural. In systemic change "the nature of the work itself, reorienting its purpose, and refocusing its intent" (p. 205) are altered. Systemic change involves new designs in the structure of the organization in terms of roles, norms, and patterns of interacting and in the organization's culture, its belief system and values. Procedural and technological changes usually accompany systemic change. Schlecty emphasizes that change cannot be thought of as only changes in individual behaviors; "changes in school districts and communities are as critical to changes in classrooms and schools as is the behavior of teachers and students in schools" (p. 16).

Bybee (1997) finds several meanings in use for systemic change. A vertical orientation to systemic change refers to reforms which look at the system from top to bottom and the reverse, for example, from district-set policies to how these appear at the local site. The horizontal orientation refers to efforts to reform all schools within a district or state. A combination of vertical and horizontal orientations is a total systems approach, targeting curriculum, policy, assessment, resources, and professional development. Finally, systemic reform can also mean replacing the current system through charter schools and voucher programs.

Bybee provides a definition of systemic reform which appears in a document from the National Science Foundation:

"Systemic reform is a process of educational reform based on the premise that achieving excellence and equity requires alignment of critical activities and components. It is as much a change in infrastructure as in outcomes" (p. 202). The central elements of systemic reform are: high standards for all students; alignment of all policies, practices, and measures of accountability; greater autonomy in site governance; increased involvement of the community in schools; increased coherence between formal and informal learning experiences; emphasis on professional development; and better articulation between precollege and post-secondary educational institutions.

There is some agreement, then, that systemic reform is more encompassing than earlier efforts at school reform. Loup and Blase (1999) believe that efforts at systemic reform are a response to a new understanding of the increasing complexity of the school as a social organization. They state,

. . . the more systemic view of schools inherent in recently-instituted policies may have set a precedent: indeed, the stage is now set for us to effectively address change in concert with the political forces we face in the 21st century. (p. 46)

*Sustainability of change.* Once schools undertake comprehensive change efforts, the issue of sustaining the changes made becomes critical. In 1978, the Rand Corporation commissioned a study of the effects of federally-funded

programs enacted in the public schools. Wasley (1991) reports that the authors of the study found that "few of the programs lasted in important ways once the federal funds dried up" (p. 12).

DuFour and Eaker (1998) write,

Schools have demonstrated time and again that it is much easier to initiate change than to sustain it to fruition. Until changes become so entrenched that they represent part of "the way we do things around here", they are extremely fragile and subject to regression. (p. 105)

Using the term "continuation" rather than sustainability, Fullan and Steigelbauer (1991) identify the conditions which must occur for changes in schools to become institutionalized: the change must be built into the school system's structure through policy statements which include budgets and time frames; there must be a "critical mass of administrators and teachers skilled in and committed to change" (p. 89); and there must be mechanisms for continued assistance and training of new members who enter the system because the turnover of teachers and administrators is a stumbling block for continuation of changes.

The components critical to sustaining changes, according to DuFour and Eaker (1998), are: communication among staff members, including a constant reiteration of the mission, core values and goals of the change effort; collaboration which is embedded in the school day, meaning that time and structures must exist for collaborative teams

to work; training of staff in collaborative processes; and a commitment by educators to accept responsibility for working with colleagues. DuFour emphasizes that the school's culture must be shaped to permit and encourage collaboration.

Cuban (2001) identifies some strategies which lead to scalability, the institutionalization of changes across an entire system. The first concerns staffing. It is important to retain key leaders and personnel and also to train new staff members. Next, district administrators, the superintendent and school board, must see the value of the changes initiated so that they are willing to allocate funds to the program's continuance once the external funding ends. Another component to this effort is to build connections with other departments within the district to share resources and with external partners such as universities and businesses. The last strategy Cuban recommends is structural, meaning that the change project uses district structures to sustain innovations, such as doing professional development through district scheduled workshops and summer training programs already in place.

St. John (2002) states that a strong local improvement infrastructure must be created at the school district level so that teachers and principals receive the support they need to sustain changes in practice. This infrastructure is composed of personnel in permanent positions as professional

developers, coaches, and curriculum specialists. St. John believes this structure is the missing link between the large funding agencies like the National Science Foundation and local districts and schools; the ongoing support provided by this group would ensure the sustainability of changes begun by outside funding.

A study of four school districts done by Florian (2000) documented the extent to which a state-sponsored reform effort had been sustained after ten years. The author defines sustained educational reform as "the perceptions by those involved in the education system of continued implementation and practice of a change that occurred initially as a consequence of a reform program" (p. 4). Florian found five major categories of the factors which influenced the sustainability of the changes:

1. Ongoing engagement and development of human capacities. The critical components for staff were: new knowledge and skills which were integrated into routine practice, commitment to the change, a disposition for learning, and the ability to develop knowledge and skills in others. As new staff members joined the schools, they had to be trained in the reform effort.
2. School and district cultures that value learning, innovation, and collaboration. The reform effort

- brought about changes in culture. The important components here were funding for and participation in staff development, common planning time for teachers, reflection on practice, and staff unity.
3. District and school structures, policies, and resource allocations that support the reform goals. Among these were creating time for collaborative work, formal structures to support professional development, and capacity building.
  4. Leadership that maintains a consistent vision. Stable leadership, as opposed to frequent turnover of key leaders, a well-designed strategic plan, and positive relationships with the members of the education system were identified as important.
  5. Political context demands, pressures, or supportive activities. State requirements and the local political context can either promote or inhibit reform. Community support for the reform is very important.

Hargreaves, Earl, Moore and Manning (2001) conducted a study of 29 seventh and eighth grade teachers who were involved in using new standards-based curricula. The teachers identified five areas which they felt had a significant effect on their ability to make changes in their

daily classroom practice, thus contributing to the sustainability of the changes:

- Traditional school structures, such as time (daily schedules, short class periods, little flexibility to the school day) and space (isolation from one another), worked against changes because they made joint planning very difficult.
- Teacher culture. Teachers in the study reported that the reforms required that teachers work together in learning communities which in many cases did not exist. Norms of isolation work against the success of reform.
- Professional learning. Teachers felt a need for ongoing training and professional development opportunities. This factor supported sustainability.
- Professional discretion. Teachers were constrained by policy mandates which were too prescriptive and standardized. They needed to be able to adapt to their unique circumstances.
- School leadership. Administrators were key to establishing an environment which would support change.

Century & Levy (2002) studied nine districts in which hands-on science programs had been instituted at grades K-6 during the past 10 to 30 years. They define sustainability

as "the ability of a program to withstand shocks over time while maintaining core beliefs and values and using them to guide its adaptations to change" (p. 4).

They found three aspects of the community and district context which can support or hinder the sustainability of reform. These are: the school system culture, referring to the extent to which individuals communicate, the degree of collegiality, support for professional growth and innovation, and the nature of the organizational hierarchy; decision-making and power (leaders of sustained programs were able to navigate through a system and influence decisions by developing personal relationships and building a network of support); and the use of equity issues, "science for all," as a motivator and rationale for creating sustainable programs.

In addition to the three aspects of context, Century and Levy found six factors related to the concrete elements of a science education program that supported sustainability: accountability, measures of student learning as a way of assigning responsibility to teachers and administrators for implementation of the programs; the availability and refurbishment of instructional materials; leadership, both formal and informal; money and how it is allocated; partnerships, either comprehensive or limited;

and professional development of teachers, principals, and other administrators.

The same study yielded six additional factors that contribute to or impede sustainability: a critical mass, referring not only to the number of people trained in the reform effort, but also to the depth of their understanding and commitment to the program; the history of the innovation, its origins and longevity; the implementation and adaptation strategies used in its adoption, including a sensitivity to the district culture; perceptions of the program; philosophical attitudes as to whether science should be taught and how it should be taught; and the quality of the program, in terms of alignment between the program and the district's accountability system.

*Section summary.* The authors and researchers cited in this section concur on the need for change in the schools. The focus on system-wide change is a more recent development in the history of change efforts. There is also agreement that change is difficult to accomplish and to sustain.

Table 1 highlights the factors identified by the authors and researchers in this section as being most important for reform efforts to take hold and continue over time. This collection of opinion and study results demonstrates that sustainability requires changes on all

Table 1

*Some Factors Which Support Sustainability of Change Efforts  
at Individual, School, and District Levels*

Level	Factors
The Individual Teacher	Commitment to the change (Florian, 2000) Disposition for learning (Florian, 2000) New skills and knowledge integrated into routine practice (Florian, 2000) Ability to develop skills and knowledge in others (Florian, 2000) Individuals communicate (Century & Levy, 2002) Personal commitment to collaborate (DuFour & Eaker, 1998; Hargreaves et al., 2001) Training in collaborative processes (DuFour & Eaker, 1998) Teacher culture that supports collaboration (Hargreaves et al., 2001) Ongoing training and participation in professional development (Hargreaves et al., 2001, Florian, 2000) Allowance for professional discretion (Hargreaves et al., 2001) Perceptions of the program (Century & Levy, 2002) Reflection on practice (Florian, 2000)
The School	Communication among staff (DuFour & Eaker, 1998) Collegiality (Century & Levy, 2002) Constant reiteration of mission, core values, and goals of change effort (DuFour & Eaker, 1998) Time and structures for collaboration built into the school day (DuFour & Eaker, 1998, Florian, 2000) Joint planning facilitated through flexibility of schedules and space (Hargreaves et al., 2001) Establishment of learning communities (Hargreaves et al., 2001) Leaders who establish appropriate environment for change (Hargreaves et al., 2001) School culture that values learning, innovation, and collaboration (Florian, 2000) Staff unity (Florian, 2000) Leaders navigate system through personal relationships and network of support (Century & Levy, 2002)
The District	Change built into system's structure through policy statements including budget and timelines (Fullan & Steigelbauer, 1991, Cuban, 2001) Funding and formal structure to support professional development (Florian, 2000) Critical mass in numbers of teachers and administrators committed to the change (Fullan & Steigelbauer, 1991) Critical mass in depth of commitment (Century & Levy, 2002) Mechanisms for continued training and assistance of new members entering system (Fullan & Steigelbauer, 1991, Cuban, 2001)

(table continues)

Level	Factors
	Efforts to retain key leaders and personnel (Cuban, 2001) Connections built with other departments to share resources and with external partners (Cuban, 2001) Use of already existing district structures to sustain innovations (Cuban, 2001) Adaptability (policy mandates not overly prescriptive and standardized) (Hargreaves et al., 2001) District culture that values learning, innovation, and collaboration (Florian, 2000, Century & Levy, 2002) Equity issues (Century & Levy, 2002) State and local political requirements and context (Florian, 2000) Community support (Florian, 2000) Nature of the organizational hierarchy (Century & Levy, 2002) History of the innovation, its origins and longevity (Century & Levy, 2002) Nature of the implementation and adaptation strategies (Century & Levy, 2002) Strong local improvement infrastructure (St. John, 2002)

levels of the educational community, not just in the individual teacher. The school and the district also have a great responsibility to contribute to the sustainability of reform efforts. In addition, the study conducted by Century and Levy (2002) suggests that there are needs specific to the kind of reform which also must be met, i.e., reform of science instruction necessitates materials and supplies for changes in practice to be sustained.

### *School Culture*

Several authors, including some previously cited, refer to the culture of the school. Culture is an important construct when trying to better understand the workings of

the school. Heckman (1993) writes, "The culture of school acts like an invisible hand guiding the thoughts and actions of those inside" (p. 266).

*Organizational culture.* Humans join together into organizations to accomplish more than what they would be able to accomplish individually. Hoy and Miskel (1982) distinguish between social organizations "that emerge spontaneously whenever individuals are living together" and formal organizations "those that have been deliberately established for a specific purpose" (p. 53).

The modern formal organization has been studied for over a century. An important theme in these studies is the relationship between the organization and the people who comprise it. Getzels and Guba (1957) were among the first investigators to offer a theory which examines the relationship. They described the organization as a social system with goals: to achieve the goals, there is an institution which must be productive, and there are individuals (actors) to do the work; the individuals' needs must be fulfilled. Getzels and Guba referred to the institution with its roles and expectations as the nomothetic or normative dimension, and the individual with his/her personality and need-disposition as the idiographic or personal dimension. The interactions between the

institution and the individual constitute social behavior, and the nature of these interactions will determine the success or failure of the organization in achieving its goals.

Many theorists believe that the culture created within the organization is the vehicle through which the tensions between the needs of the organization and the needs of the individuals in it are balanced; the culture is the cement which binds these disparate needs together. Schein (1992) defines culture as:

. . . a pattern of shared basic assumptions the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 12)

Schein believes that for an organization to be successful, there must be a high degree of consensus among members on these internal issues:

- creation of a common language and conceptual categories so that all members hold the same understanding of gestures, action, and speech
- definition of the group's boundaries: who belongs and who does not, so that individuals are secure about their membership

- rules and criteria for how to get, maintain, and lose power so aggression is appropriately channeled and formal status roles are understood
- rules that define peer relationships and intimacy to avoid conflict over ways to express friendship and affection
- a system of sanctions and rewards to ensure high performance
- a way to explain unexplainable events: ideology, stories, myths to help members deal with events outside their control.

If all these factors are dealt with, and consensus on them is firm, the individuals then become a functional group and can concentrate on working toward organizational goals.

To understand organizational culture, Schein (1992) describes its three levels. Artifacts are the visible organizational structures and processes; espoused values are the philosophies and goals which are expressed orally and in writing; underlying assumptions are the unconscious, taken for granted values which are the source of all beliefs and actions of the organization. The underlying basic assumptions exist at the deepest level of the culture. Basic assumptions are extremely difficult to change. Schein writes,

To learn something new in this realm requires us to resurrect, reexamine, and possibly change some of the

more stable portions of our cognitive structure. . . . Such learning is intrinsically difficult because the reexamination of basic assumptions temporarily destabilizes our cognitive and interpersonal world, releasing large quantities of basic anxiety. (p. 22)

Shared basic assumptions form around the dimensions of reality and truth, time, space, human nature, human activity, and human relationships.

In addition to organizational culture, many authors have written about the climate of organizations. In a study of the evolution of concepts in organizational science, Reichers & Schneider (1990) identify differences between climate and culture. Climate consists of individuals' shared perceptions of the way things are done in an organization, its practices, procedures, and policies. Climate studies focus on effectiveness. Culture refers to shared meanings that are largely subconscious; the shared meanings provide the group with the ability to survive and achieve internal integration. Studies of culture usually consist of description and attempts at understanding. Culture

. . . focuses on the assumptions and values that underlie the policies and procedures that are indicative of climate. That is, culture is at the next higher level of abstraction and so captures additional influences (direct and indirect) on behavior and on lower-level context variables, such as climate. (p. 28)

Reichers and Schneider find a large degree of overlap between the two constructs and believe that over time the distinction between the two will lessen.

*The culture of schools.* Sarason (1982) defines the culture of schools as the "distinctive, tradition-based axioms, values, and outlook of school personnel" (p. 3). He calls for an ecological approach to the study of schools; instead of looking at individuals, it is important to examine the "extra-individual structured characteristics" (p. 131) that hold sway over all members even though they are often not aware of these influences on them.

A singular characteristic of the school organization is that most of its members, the students, comprise a captive membership. They are in attendance not always voluntarily, but because society has decided that school is the appropriate place for its children and young adults to be. It is then imperative that a strong school culture be created, one that takes advantage of young people's talents and energies, guiding them toward productive activities which result in learning. The school culture is the vehicle through which individual members' goals and the institution's goals are integrated and harmonious.

Maehr and Midgley (1996) believe that the culture each school creates is the determining factor in student motivation to learn, to participate actively in the educational enterprise. In their effort to construct a theory of school culture, they propose that there are two purposes or emphases that schools tend to exhibit: an

emphasis on ability (through sorting, classifying, and tracking students according to performance) or an emphasis on accomplishment of task (by promoting the inherent value of learning and the development and growth of each child). As students progress through the educational system, they become aware of the assumptions underlying the policies and practices of their school organization, and the perceptions they form affect their investment and willingness to commit to the process.

Maehr and Midgley write that "school culture is likely to significantly shape the individual goals students come to hold. As the culture of the school serves this purpose, it frames the quality of motivation and learning that will be exhibited" (p. 66). Thus, effective school works to build a learning culture for all children, beginning with the strengths each child brings with him/her to the school and then building growth from there; as each child perceives that an "equal shot" at learning exists, he/she will want to achieve the organization's goals.

Maehr and Midgley thus emphasize the fundamental importance of school culture for children; Rosenholtz (1991) demonstrates the importance of the school culture from the point of view of teachers and its subsequent effect on student learning. In a study of rural and impoverished elementary schools in Tennessee, Rosenholtz looked at how

the daily work experiences of teachers affect their beliefs, understandings, and behaviors and conversely how these then affect the work of the organization; she refers to this reciprocal relationship as the social organization of schools. In her study, Rosenholtz defined the effectiveness of schools as a combination of: the problem-solving and renewal capacities of schools, defined as teachers' opportunities to learn; the satisfaction of individual needs and organizational tasks, referred to as teachers' certainty about instructional practice; the creation and maintenance of motivation and values of the school, called teachers' workplace commitment; and the productivity of the school as seen through student learning outcomes.

Rosenholtz's study yielded descriptions of high, moderate, and low consensus schools. The most effective schools were those in which a high degree of agreement existed as to schools goals, which were clearly defined and shared; there were norms of teacher collaboration, with people asking for and giving advice and help to advance schools' goals; a spirit of continuous learning and interest in the improvement of practice was held by teachers; there were processes whereby teachers could acquire greater technical knowledge about instructional practices so that teacher certainty was increased; and teachers' commitment to

their work and their students was expressed in terms of hope and possibilities for attaining school goals.

In contrast, in low consensus schools there were no clear goals or conflicting goals; teachers were isolated and norms of self-reliance existed; there was little or no interest in improving teaching practice; the children, their families, or society were blamed for low academic achievement; and teachers had lost faith in their ability to bring about learning in children. Teachers had given up. Rosenholtz's study clearly demonstrates the importance of the school culture from the teachers' perspective and how teachers' experiences in that culture can enhance or curtail their students' learning.

The school culture is one of the conditions that allows organizational learning to grow and flourish (Leithwood, Aitken, & Jantzi, 2001). Leithwood et al. identify three cultural factors that limit the development of organizational learning: norms of equality, autonomy, and isolation; the practicality ethic, which refers to a focus on "how to" teaching practices rather than thinking more deeply about purposes and larger concepts; and the tradition of oral communication in schools which prevents the building of a sound technical core of schooling.

Several authors have developed typologies for describing the cultures found in schools. As described

previously, Rosenholtz (1991) classifies some schools as "moving" and others as "stuck". Fullan & Hargreaves (1996) identify individualistic cultures and collaborative ones. In individualistic cultures, norms of privacy and isolation are very strong. While this allows teachers the freedom to do as they please, it prevents them from getting advice and suggestions which might improve their practice. The authors write, ". . . The opportunity and pressure arising from new ideas are inaccessible . . . (this) leads to safe, non-risk-taking forms of teaching that do little to assist student achievement" (p. 39). Collaborative cultures, on the other hand, can help teachers bring about improvements in student achievement because teachers engage in joint work, learning from each other.

Peterson and Deal (1999) label certain school cultures as toxic. In these schools, negativity reigns, staff is fragmented and/or combative, and efforts to improve are met with derision or indifference. In schools with strong positive cultures, on the other hand, there exist norms of collegiality, hard work, and effort. Members share a sense of purpose and are committed to learning.

*The effects of school culture on change efforts.* There is agreement among many theorists that school change efforts cannot succeed when the effect of the school culture is not

taken into account. Bulach and Malone (1994) studied 20 schools using a framework of culture/climate attributes (staff collaboration, learning environment, openness, and trust) aligned with institutional attributes (orderly school, instructional leadership, parent and community participation, expectations for student learning and behavior, and the quality of instructional programs for all students). They found that there was significantly higher student achievement in students at schools with positive climate and culture than those in negative settings.

Leithwood, Leonard, and Sharrott (1998) synthesized the results of three previous studies to identify the conditions that foster organizational learning in schools. Looking at data from 111 teachers in 14 schools engaged in restructuring initiatives, these authors found five variables that most strongly influence the processes which result in teachers' individual and collective learning: district, school leadership, school culture, school structure, and policies and resources. When viewing the total of direct and indirect associations, teachers identified the district, school leadership, and school culture as the most important. When only the overall direct associations were considered, school culture led all other variables in its effect on creating the conditions which foster organizational learning.

Hoy and Sabo (1998) conducted an extensive study of school climate, conceived of in terms of the degrees of openness and health of the organization, and school effectiveness as measured by student achievement in math, reading, and writing. One of the quality indicators they identified was culture. They state, "Because it is difficult to assess the culture of the school directly, we map the culture indirectly, first by conceptualizing critical dimensions of school culture, and then by developing a set of scales to measure each element" (p. 92).

They found five elements that are characteristic of strong school cultures. The first is a sense of shared identity. Members of the school have a strong sense of what their organization stands for; there is a clear vision guiding their actions to distinctive goals. Trust is another factor. Members trust the principal and their colleagues in strong school cultures. The third element is authenticity of the principal and teachers. This refers to an acceptance of responsibility for one's own behavior and a willingness to admit to mistakes made. Behavior is non-manipulative and individuals' roles are subordinate to their sense of self. Cooperation is another factor identified; a sense of teamwork exists in strong school cultures. Teachers like, help, and support each other without taking advantage of anyone. The last element identified in the study was

participation, referring to teachers' belief that they have a voice in important decisions made at the school regarding instructional matters.

The Hoy and Sabo (1998) study of 87 New Jersey middle schools with 2,777 teachers found significant and substantial correlations between strong school culture and teacher and principal openness, school health, student achievement in reading, writing, and math, and overall effectiveness of the school.

*The factors of school culture.* As mentioned in the previous section, Hoy and Sabo (1998) believe culture is difficult to measure directly. Gruenert and Valentine (1998) have developed a framework for conceptualizing the components of school culture. There are six factors in the framework; Gruenert (2000) states that the six describe the extent to which collaboration is present in a school. They are:

- Collaborative leadership. School leaders establish and maintain collaborative relationships with the staff of the school. They value teachers' input and include them in decision-making. They support teachers' efforts to improve practice.
- Teacher collaboration. Teachers participate in constructive dialogues which advance the school's

vision. They plan together, observe each other, and evaluate programs.

- Professional development. Teachers value their ongoing personal growth and also school improvement. They look for new ideas from professional sources and keep current with advances in understanding of educational issues.
- Collegial support. Teachers trust and value each other; they help each other.
- Unity of purpose. Teachers work toward a common mission for their school.
- Learning partnership. There is communication and cooperation among teachers, parents, and students as they work together toward the goals of student learning.

The extent to which these factors are present determine the nature of the school culture.

*Section summary.* The effects of culture on the school are profound; it can be the cement that binds its individual members together to work toward a common goal, or it can be destructive of all such efforts. The culture must be dealt with first in any change effort. The underlying assumptions which form the invisible bedrock of people's beliefs and values are difficult to modify; for a change effort to

succeed, assumptions must first be uncovered and then re-shaped, allowing a new school culture to grow.

The focus of a strong school culture must be on student and adult learning, with deep thinking about the concepts and purposes of instruction; to achieve this, norms of autonomy and isolation must be overcome. A framework of six factors of school culture provides a tool for trying to understand what it is comprised of and its effects. There is evidence that the nature of the school culture has an effect on student learning.

#### *Teacher Collaboration*

Teacher collaboration is one of the factors identified by several of the authors and studies already cited as critical in any change effort, whether in schools where a strong positive culture already exists or in schools where a negative culture must be turned around. Fullan and Hargreaves (1996) offer a description of four types of collaboration observed in schools.

Schools characterized as "Balkanized" are those in which teachers group into cliques, identifying only with that subgroup, and often in conflict with other groups for resources and position. This type of collaboration results in miscommunication among the total staff; programs and expectations are inconsistent. "Comfortable collaboration"

is a superficial kind of collaboration. Teachers give each other hints and advice and share materials, but they do not engage in any serious reflection about practice, nor do they observe each other or plan together. They continue to act alone in their classroom role. "Contrived collegiality" refers to bureaucratic arrangements such as peer coaching, site-based management, and mentoring programs. These are patterns of interaction imposed on a school, and instituted by administrators; the authors state that at times they can be a useful introductory stage to achieving a true collaborative work culture.

True collaboration exists when teachers are strongly interdependent, sharing a common vision and responsibility for achieving improved services for students. Teachers examine their practices critically, using a variety of structures such as teaming, classroom observation, action research, and ongoing peer coaching and mentoring. Fullan and Hargreaves (1996) argue that individualism in schools, teachers working alone and in isolation, must be eliminated while preserving teachers' individuality, "the voicing of disagreement, the opportunity for solitude, and experiences of personal meaning" (p. 43).

*Studies of collaboration.* Lortie's (1975) classic sociological study of teachers and their work lives offers

an explanation of why collaboration is most often not the norm in schools. Lortie emphasizes the cellular pattern of growth of the schools in the United States. During colonial times, schools were separated by great distances and of necessity had to be self-sufficient. As cities were established and grew, those separate cells were merely combined under one roof. There remained a high degree of separation among teachers and very low task interdependence. Other factors contributing to the lack of a more coordinated organizational structure were the high turnover of teachers, the difficulty for married females teachers (the majority of the profession) to dedicate time toward collaborative work beyond their formal work schedule, and male teachers' additional roles as coaches or in second jobs.

Lortie's study used interviews, surveys, and observations. In interviews with teachers from the Five Towns research, teachers were asked to describe what constituted "a good day" at school. The key theme which emerged from teachers' responses was that of the importance of the bounded nature of the classroom. Other areas of the school--the halls, cafeteria, assembly room--evoked negative comments. The interactions between the teacher and students were of prime value and concern; any intrusion on these by the principal, the nurse, parents, or other teachers was undesirable. Lortie writes, "Walls are perceived as

beneficial; they protect and enhance the course of instruction. All but teachers and students are outsiders. That definition conveys an implicit belief that, on site, other adults have potential for hindrance but not for help" (p. 169).

In response to a survey question about teacher interactions, 45% of the teachers interviewed reported having no contact with other teachers; 32% reported some contact, and 25% (p. 193) reported that they have much contact with others in the form of joint planning, looking at students' work, and some instances of teaching each other's classes. Lortie found that whether or not teachers interact with each other on professional matters is a voluntary decision; teachers' norms include the belief that assistance should be given when it is asked for, but much care has to be taken to ensure that the asker's prestige does not suffer as a result. Another strong norm Lortie identified is egalitarianism; no one teacher should appear excessively more knowledgeable or capable than others.

Little (1990) reviewed the research of the 1970s and '80s to discover the nature of teacher collegiality and its results. She found that teachers believe that collegiality with their peers must ultimately benefit students. They feel their primary obligation is to make their relationships with students more productive; this relationship is also their

chief means of reward. The acceptance of collegial practices, therefore, will depend on how those practices affect students' learning. Little found some studies which identified gains in student achievement as a result of grade-level teaming at the elementary school and department-level teaming at the junior high. She identified some significant correlations between teaming arrangements and teachers' acceptance and implementation of new curricula; there was also some evidence that joint work helps teachers refine existing curricula and instructional practices.

Although "Overall, collegiality is rare" (p. 180), Little was able to identify the critical practices which characterize collegial interactions as described in the literature. First, there is talk about teaching; not war stories, but talk based on theory and talk which gives teachers practical tools to use in the classroom. There is shared planning and preparation time among teacher colleagues. Their individual planning time is lessened, but they participate because of the increase in ideas and materials which they gain. Teachers are able to observe each other's classrooms, do peer coaching, and sometimes videotaping of lessons. Administrators find ways to get teachers time to do this. Finally, there is an ongoing scrutiny of practice. Teachers train each other and follow up in classrooms and in study groups. Groups that have built

these practices into their daily work day are those who have successful collegial relations.

In her study of Tennessee elementary schools, Rosenholtz (1991) looked for evidence of collaboration among school staffs to help explain why some groups are more productive than others. Her definition of faculty collaboration was "requests for and offers of collegial advice and assistance" (p. 41). She posited that the social organizational variables which determine the extent of collaboration in a staff are: teacher certainty about the technical culture of teaching (knowing how to teach, the appropriate instructional practices to use), which decreases threats to their self-esteem so they are more open to interactions with others; shared teaching goals which help them feel part of a group effort; some involvement in school decision-making; and team-teaching. Rosenholtz's study demonstrated that these variables were all significant predictors of teachers' willingness to collaborate.

Of the 78 schools in Rosenholtz's study, 13 were found to be collaborative, 50 were moderately isolated, and 15 were isolated. In response to the question "Do you share things with other teachers?" (p. 51), 47% of the teachers in collaborative schools reported sharing instructional materials and ideas and 50% reported working with others to problem solve and plan; in the isolated schools, 56%

reported no sharing at all. Another finding was that there was a clear relationship between teacher collaboration and student learning: in collaborative schools students had higher achievement levels in reading and math.

*Recent studies of collaboration.* "Professional community" is the term used by Louis, Marks, and Kruse (1996) to denote the interactions of teachers when participating in ongoing efforts to improve practice. They looked at survey data and case study data from 900 teachers in 24 schools engaged in restructuring efforts; their study attempted to identify the organizational factors which contribute to professional community and then the consequences of professional community on teachers' sense of responsibility for student learning. This last was defined as teachers' perceptions of their ability to influence student learning and academic success, their ability to make a difference in students' lives, and their responsibility for school-wide issues as opposed to activities within the individual classroom.

The study revealed the existence of professional community in some of the schools; a tentative conclusion was that professional community may be more difficult (though not impossible) to establish in typical comprehensive high schools than in elementary and middle schools. Structural

conditions which support professional community are: scheduled common planning time, teacher empowerment in decision-making, and simplified staffing through a narrowing of the curriculum or by having teachers take over some of the functions carried out by specialists. Human and social resources are also critical to the formation of professional community. Respect among staff is a key. The authors state that it is important to focus attention on improving the culture, climate, and relationships among personnel; these factors have “. . . received too little attention. While it may be easier for policymakers to imagine how to restructure schools rather than change their culture, the latter also appears to be a key to successful reform” (Louis, Marks, & Kruse, 1996, p. 786).

Their study also indicates that teachers' individual job satisfaction and the school's level of professional community are associated with teachers' responsibility for student learning; the authors believe it is reasonable to assume that as teachers' responsibility for student learning increases, there will be improved student achievement.

Can collaboration be achieved through mandate? Harris & Drake (1997) conducted a case study of a school in which all teachers participated in action research teams over a three-year period. The principal required that all teachers join a team, believing that action research would be a valuable

vehicle for professional development and that mandating collaboration would be a good way to begin to improve the school. This is an example of the use of "contrived collegiality" described by Fullan and Hargreaves (1996).

By the end of the three years, the authors found that a majority of the participants were positive about their work on teams; they felt the teamwork helped them deal more productively with change efforts. They also were positive about the results of bringing together teachers from different departments. There was increased understanding across previously more isolated groups. Most teachers reported a belief that a collaborative culture had been created at their school.

Participants also identified some problems. The fact that the principal had mandated the participation of all the staff was frequently mentioned; there was resistance on the part of some staff, manifesting itself by absence at meetings or by not doing work assigned by the team. The lack of clearly stated goals at the initiation of the project was also mentioned. Teachers spent almost the first year struggling with what action research actually is. A very large concern was the amount of time required for the project. Teacher workloads were already heavy; the additional time needed for action research teams was seen as a negative.

Bryk, Camburn, & Louis (1999) report on professional community in Chicago public elementary schools. In this article, the authors identify professional community as present in schools in which "interaction among teachers is frequent and teachers' actions are governed by shared norms focused on the practice and improvement of teaching and learning" (p. 753). Using surveys completed in 1994 by 5,690 teachers in 248 schools, the authors looked for the presence of six components of professional community. They are: reflective dialogue, teachers' ongoing communication about their teaching practice and student learning and including schoolwide plans for improvement; deprivatized practice, meaning that teachers observe each others' work, plan changes, and assess the results; peer collaboration, meaning shared work with teachers participating in schoolwide change efforts; a focus on student learning with clear expectations for high academic performance; collective responsibility for school operations and improvement; and the socialization of new members--it must be deliberate so that gains are sustained over time.

Using those six factors to initially identify schools in which professional community existed, the authors then looked for the effect of school size, principal leadership, and trust and respect among colleagues on the development of professional community. Among the findings were that small

school size is an important structural component which permits professional community. Large schools were able to develop professional community, but the process is more difficult. However, small school size did not guarantee the existence of professional community. The behaviors of principals which support professional community are frequent and regular visits to classrooms and including others in leadership by encouraging teachers to become more involved and to try out innovations. The authors found that social trust among faculty was clearly the strongest facilitator of professional community, highlighting the importance of collaboration among staff. "When teachers trust and respect each other, a powerful social resource is available for supporting the collaboration, reflective dialogue, and deprivatizations characteristics of a professional community" (p. 767).

Sawyer (2001) studied three teachers (one in middle school and two in high schools) over a period of 10 years to learn about the conditions which support collaboration. Sawyer believes the factors which allow teacher collaboration to be successful are: a supportive school culture with norms focused on instructional practice; department sub-cultures as a context for teacher interactions; meaningful content in context, referring to the degree to which teachers perceive that collaboration

helps improve student learning; and resources, especially time.

Sawyer noted similar themes which emerged from the three teachers' perceptions of what supported them in collaborative efforts. The personal characteristics of the teachers were seen as important. The strongest characteristic they held in common was a great concern for student learning; they believed in experiential learning. They were willing to have their practice examined, opening their classrooms to observers. They also shared a belief that it was important for them to be able to choose their own collaborative partners.

Another theme noted was that the teachers' notions of the subject matter they taught evolved over time. They moved from a traditional approach to teaching to a more open-ended approach. Their tolerance for ambiguity increased, as did their appreciation of the multiple layers of curriculum. There was also a growth in their pedagogical content knowledge.

Teachers identified support from their administrators, their departments, and the school as important. Letting them share their knowledge with others was facilitated by administrators, and their perception of personal support from administrators and an appreciation of it grew over the years.

The final theme identified was that over time, the teachers' perspective shifted from an almost exclusive focus on the classroom to a broader concern for the school as a whole. They understood that there is a relationship between quality instruction and the school culture and structures.

*Section summary.* The authors referred to in this section see teacher collaboration as a potent force for bringing about change in schools. Assumptions of isolation and autonomy within the single classroom can be identified and replaced by a focus on joint work and the deprivatizing of professional practices. Teachers work interdependently toward a common vision of improved services for students through peer coaching and mentoring, teaming, classroom observation, action research, and other processes in which teaching practice is scrutinized on an ongoing basis.

There is evidence that teacher collaboration can result in improved instruction. Teachers must perceive that this is the case; they commit to collaboration when they see the benefit of it for their students. Another effect of collaboration is that teachers' perspectives widen, shifting from an almost exclusive interest in one's own classroom to a more systemic, school-wide vision. The school culture is positive and healthy.

Principals and administrators can initiate the structures and processes that lead to collaboration, but they need help and the participation of many others to establish and maintain the conditions which support true collaborative cultures.

### *Teacher Leadership*

Many researchers support the idea of broadening the understanding and practice of leadership in contemporary organizations.

A brief review of various historical perspectives of leadership that evolved during the 20th century reveals changes in thinking about what leadership is, who exercises it, and how leadership is best accomplished.

*Historical perspectives of leadership.* When people join together to form organizations, plans are made and actions are taken because one or more individuals lead the way. Yukl (as cited in Hoy & Miskel, 1996) defines leadership as "a process of social influence by one over others to structure activities and relationships" (p. 374).

For the first half of the 20th century the idea that leaders were born, not made, held sway. Investigators into the phenomenon of leadership studied prominent leaders and tried to find the characteristics common to all of them.

With this checklist of traits of personality and behaviors, new candidates for leadership positions could be rated and evaluated on their potential for success.

Stogdill (1974, as cited in Hoy & Miskel, 1996) reviewed the studies that had been done to that point and found that traits alone could not explain effective leadership. While some characteristics such as intelligence, dependability, participation, and status were identified in studies of the most capable leaders, Stogdill determined that other factors must also be considered because the situation the leader acts in is so different from one instance to another. Stogdill thus added the impact of factors outside the individual leader--factors such as the organizations' goals and the nature of the people in it.

Researchers then began to analyze the effect of situations on leaders' performance. Contingency models of leadership emerged, such as Fiedler's (1967, as cited in Hoy & Miskel, 1996). These postulate that a leader's effectiveness will be contingent upon a combination of the traits and behaviors of the leader and the characteristics of the situation: the nature of the leader's subordinates, the size and structure of the organization, the leader's given role and position, and both internal and external environments. Thus theorists demonstrated a growing understanding of the complexity of leadership.

An important step in the evolution of thought on leadership was the work done by Burns in 1978 on transactional and transformational leadership (as cited in Bolman & Deal, 1997). Burns studied political leaders, and in the exchange of jobs for votes he saw leadership based on a quid pro quo. Transactional leaders ensure that work gets done by rewarding or promising to reward good performance; they use threats and discipline in cases of poor performance. Great leaders such as Roosevelt, Gandhi, and King, on the other hand, transform their followers: "they evoke their constituents' better nature and move them toward higher and more universal needs and purposes. They are visionary leaders . . . Symbolic leaders . . ." (Bolman & Deal, 1997, p. 314).

Smircich and Morgan (1982) proposed that leadership is a socially constructed process between leaders and those they lead; the leader has the obligation or a perceived right to define the reality of others. They call this "mediating leadership". Reminiscent of Getzels' and Guba's (1957) distinction between the idiographic and nomothetic dimensions of organizations, Smircich and Morgan state that mediating leadership bridges "the gulf between the requirements of institutionalized structure and the natural inclinations of its human agents" (p. 260).

The authors also warn, however, against the possible negative consequences of the leader as the maker of meanings: this may result in trained inaction, an inability of individual members to observe, interpret, and take responsibility for their own actions. They therefore propose replacing traditional Western hierarchical patterns of leadership with more equalized patterns of interaction. When power is distributed more evenly throughout the organization, the individual members develop adaptive capacities "at the level at which they are needed, increasing the learning and adaptive ability of the whole" (p. 271).

Wheatley (1994) offers metaphors from new discoveries in the natural sciences which can help develop better ways to organize human efforts. She believes that contemporary organizations are still rooted in the mindframe of 17th century physics, principally Newton's mechanical universe. His universe was predictable and precise; to understand the whole machine, he encouraged us to look at each piece of it separately. The mechanical universe can be taken apart and put back together again "without any significant loss" (p. 5).

Wheatley describes how Newtonian thinking profoundly influenced the organizational designs of theorists such as Taylor and Weber. Taylor (1911, as cited in Hoy & Miskel,

1982) strove to maximize the efficiency of humans in the industrial organization by considering the worker to be a part of the manufacturing process, much as the machine itself was. Using the principles of his scientific management approach, each worker was assigned a discrete task to be repeated over and over again. Individual workers formed assembly lines; the machine became the metaphor for the organization.

Weber published *The Theory of Social and Economic Organization* in 1947; it was the classic presentation of the modern-day bureaucracy. Its characteristics are: a division of labor for the sake of efficiency, as promoted by Taylor; this division of labor results in specialization; specialization produces greater expertise on the part of some employees, thus bringing about even greater efficiency; there is a stress on an impersonal, rational atmosphere for enhanced decision-making; a hierarchy of roles of authority exists so that decisions made at the top levels are implemented by those at lower levels; rules and regulations ensure the smooth functioning of the organization; and a career orientation provides for the promotion and retention of more capable employees.

Wheatley believes that the designs of Taylor and Weber continue to pervade contemporary thinking and actions regarding organizations and leadership. Schein (1992) would

say that individuals' deepest assumptions have been formed from those models. The mindset of the mechanistic, bureaucratic model holds organizations and their leaders back, preventing them from finding creative solutions to organizational problems.

Wheatley proposes that principles found in nature can and should be applied to human organizations. These principles are: participative management, which means that individuals in organizations will accomplish more the more they feel a part of the organization; communication of information, which must be freely exchanged at all levels because only through the sharing and discussion of information can people make sense of the complexity around them; a new understanding of autonomy, meaning that whole systems remain productive only by giving autonomy to smaller units at local levels; and self-reference, the ability of the organization to reflect on itself and change while maintaining its frame of reference, a clear sense of its vision, beliefs, and values. Wheatley considers self-reference the most important principle; it is what distinguishes living things from machines. She also calls this principle self-organizing and self-renewing, which is highly related to Senge's (1990) and later Leithwood's (1994) conceptions of organizational learning. Wheatley's view of leadership thus predicated giving greater autonomy

to smaller units at local levels of the organization. These are better equipped to respond rapidly and adjust to changing environments, and increased responsiveness at those local levels will lead to overall stability and productivity of the whole system.

Bolman and Deal (1997) state that it is "misleading and elitist to imagine that leadership is provided only by people in high positions" (p. 295); they believe the wise leader will build teams to provide leadership in each of the four dimensions of organizations which they have identified, the structural, the political, the human resources, and the symbolic.

Senge, Kleiner, Roberts, Ross, Roth, and Smith (1999) also call for a new understanding of leadership which will take us beyond the image of the "hero-leader to the rescue" (p. 11). Instead, they state that leadership must come from many people in many positions. To build leadership communities, the authors distinguish among three types of leaders:

1. Local line leaders--the authors use the example of teachers and principals to describe this level.

These are the people who have the authority and the responsibility for organizing and carrying out work at their local level; they are vital because they

are in the best position to test and evaluate new ideas and approaches to their work.

2. Network leaders--these are the people in the training or executive development departments of their organizations who work throughout the larger organization to help local leaders by creating networks and alliances. These leaders are the "seed carriers".
3. Executive leaders--these leaders are in the highest positions of the organizational hierarchy. They are the ones we have traditionally looked to for all leadership, such as a school superintendent.

The authors believe that leaders at all three levels are necessary to initiate and sustain meaningful change, change in both individual beliefs and behaviors and change in practices and systems of the whole organization. They write, "In essence, leaders are people who "walk ahead", people genuinely committed to deep changes, in themselves and in their organization. They naturally influence others through their credibility capability, and commitment" (p. 19). The learning organizations which result are then able to build their capacity for ongoing change.

A new understanding of leadership has thus emerged. In the field of education, where districts and schools have always been organized around hierarchies of power and

administration, looking to teachers for leadership is a novel challenge.

*Extending leadership to teachers.* The pivotal time for the inclusion of teachers in the change process was the mid-1980s (Urbanski & Nickolaou, 1997). In addition to the publication of the Carnegie Report (1986), "A Nation Prepared: Teachers for the 21st Century," the National Board for Professional Teaching Standards was created in 1987. Many districts began to offer teachers opportunities for much greater involvement in extra-classroom activities.

Teachers called for increased professionalization and identified the important characteristics of what would constitute the profession of teaching: a shared knowledge base of subject content, learning theory, and children; high standards of practice; internship for novices, in the hands of expert colleagues; differentiated roles, responsibilities, and compensation; professional discretion for practitioners, without excessive supervision; opportunity for promotion within the teaching ranks, and accountability for teaching to standards, meeting the needs of students, and ongoing reflection of practice.

The new call for teacher leadership emerged from those dissatisfied with current conditions in education--policymakers, academicians, researchers--and is fueled by important and conclusive research conducted over the last 20 years that demonstrates that teachers, too long silent and isolated in classrooms, must take more

leadership in the restructuring of public education.  
(Wasley, 1991, p. 5)

Wasley goes on to explain that teacher leadership is believed to be a vehicle for improving the quality of student learning, for retaining people in the schools, and for assuring the continued growth of the most talented in the profession.

There have been three different historical approaches to teacher leadership, according to Silva, Gimbert, and Nolan (2000). The first wave was begun with a concern for efficiency and effectiveness in the system; teachers were assigned roles as department heads, master teachers, or union representatives. The teacher leader was a type of manager. The second wave interpretation of teacher leadership came about when teachers' instructional knowledge and expertise were recognized. At that point, the positions of curriculum developers, staff developers, and team leaders were created. These jobs took teachers out of the classroom; people in these positions were outside the schools and no longer directly involved with students. The third and current approach to teacher leadership seeks to involve classroom teachers in culture building through meaningful participation in efforts to change the goals, roles, and structures of their schools. As conceptualized by Cuban (1990a), this third wave is an attempt at second-order change while the first two waves were first-order changes.

*Justification for teacher leadership.* Barth (1990) favors the creation of communities of learners, in which students and adults are learning actively and encouraging each other's learning, and also communities of leaders with students, parents, teachers, and administrators engaged in leadership roles. Referring to the benefits for teachers who participate in school leadership, he writes:

(These opportunities) offer possibilities for improving teaching conditions; they replace the solitary authority of the principal with a collective authority; they provide a constructive format in which adults can interact, thereby overcoming daily classroom isolation with youngsters; they help transform schools into contexts for adults' as well as children's learning; and participation in leadership builds community. (pp. 132, 133)

Katzenmeyer and Moller (1996) also support teacher leadership because they see teachers as being at the center of the learning endeavor: they are the ones "who set the norms, . . . initiate new and transferring personnel, and they establish 'the way we do things around here'" (p.13). These authors believe that change will not occur by mandate; change comes about on a person by person basis. The way to engage people in a change effort is to give them leadership roles.

In a discussion of the need for school change, Lambert (1998) states that leadership must be shared and that the capacity to lead must be built in all staff members. She believes that every member of the school has the right to

work in leadership roles: "Democracy clearly defines the rights of individuals to actively participate in the decisions that affect their lives" (p. 9).

*Parameters of teacher leadership.* What does teacher leadership encompass? What is the role of the principal when teachers become leaders? Lambert (1998) envisions that more than half of each school staff would have and exercise leadership skills in a variety of roles. The roles might include: participation in governance groups which make decisions for the site after consultation with all members; collaborative action research groups to study practice, with all faculty serving at least once on an ad-hoc basis; grade-level teams; and interdisciplinary teams. For Lambert, the principal's role is not lessened; indeed, the principal becomes even more important in this kind of setting because the endeavor is so complex. The skills a principal needs in these circumstances are those of initiation, support, and visioning. Instead of telling people what to do, the principal must now create in people the capacity to analyze, consider, and decide how to proceed on their own. The initiation of leadership capacity is accomplished by moving away from dependency relationships and creating an environment of collegial relationships. The principal supports the process by finding ways to provide teachers

with time for working together and by locating resources needed. Most importantly, the principal must sustain the schoolwide focus on both student and adult learning, and continuously express this vision. In essence, the principal becomes a teacher of teachers.

Katzenmeyer and Moller (1996) want all teachers to become engaged in leadership tasks. Rather than thinking of teacher leaders in the traditional formal roles of department heads, or lead or master teachers, like Barth (1990) they promote the idea of leadership communities, with teachers serving in leadership positions as needs arise, such as in curriculum development, grant writing, and extracurricular activities. Teacher leaders continue to work in the classroom, but they must commit to motivating and helping colleagues improve by sharing their technical knowledge. They must continue to learn themselves and serve as models for life-long learning.

For Katzenmeyer and Moller, the principal is also the key person in the formation of teacher leaders. The principal serves as a model so teachers can learn leadership strategies and skills; he/she acts as a co-learner with teachers endeavoring to improve practice; the principal works to remove obstacles teachers face; and actively seeks out both willing potential leaders and those who hesitate or resist becoming involved in leadership.

*Developing leadership skills in teachers.* Barth (1990) makes a case for the need for principals to actively develop leadership among all teachers on staff. He contrasts the principal as the directing, authority figure with the principal as coalition builder and states, "It has become increasingly important to share leadership and to no longer even aspire to fully understand or control every aspect of the school" (p. 133).

As coalition builder, the principal should give authority to teachers on school issues they feel deeply about, matching teachers' strong interests with school concerns that need improvement. In addition to supporting more experienced teacher leaders, the principal must work with beginning leaders, not relying on the same core group of teachers over and over again. Gradually the new leaders' level of independence should be increased. When failures occur, the principal should not step in and take over, but should definitely share in the responsibility for the failure. On the other hand, when successes occur, Barth believes they should be attributed to the teacher and be publicly recognized. Most importantly, the principal has the responsibility of constantly expressing the goals and vision of the school.

According to Lambert (1998), teachers can learn to become leaders through a developmental process, moving

gradually from their focus on the classroom to a more systemic perspective. The skills and processes teachers have to become proficient in include: communicating well, developing an ability to express the vision and goals of the school, facilitating group processes, mediating conflict, understanding the change process and how individuals react to change, and how adults construct knowledge. Teachers can learn the needed skills by observing and then practicing them, being coached on specific techniques of facilitation, and through dialogue.

For Katzenmeyer and Moller (1996), the transition of teacher to leader requires a type of professional development that is very different from the customary model; instead of consuming information, techniques, and new practices developed by others, the teacher must be taught to act and invent. They identify the following components for the development of teacher leaders:

- Teachers must engage in a personal assessment of their individual beliefs, philosophies, and values about their professional work. They must be aware that not everyone shares those same beliefs.
- They must learn to think of change as occurring school-wide rather than only in the individual classroom.
- They must learn how to lead groups, influence

others, understand others' needs, listen actively, and act on the information they obtain from data.

- They must become adept at developing action plans and following them to completion.

*Constraints on teacher leadership.* Many factors mitigate against the successful development and practice of teacher leadership. Katzenmeyer and Moller (1996) find that the most difficult ones to surmount are changes in relationships, organizational structures, time, and funding. The first refers to the shift teachers must make away from norms of individual effort, privacy, and isolation. "The egalitarian nature of teaching does not encourage a teacher to step out and take leadership roles" (p. 60). Changing roles is risky and often uncomfortable for teachers; they may fear that their actions will cause friction, and they may also fear the criticism of their peers.

Teacher leaders are often at odds with the traditional structures of schools: the principal must be willing to give over some powers associated with that position in the school hierarchy, and district level officials may not be supportive of the attempts made by individual sites to develop teacher leadership. Additionally, the public, including parents, community members, and interest groups, may oppose these efforts. Katzenmeyer and Moller again

highlight the importance of the principal in this process because in the face of opposition, the principal is the person best situated to act as a buffer between those trying to initiate change and the resisting forces.

Time, the third constraint identified by these authors, is critical because the process of bringing about change is so time-intensive. Teachers need time to learn and practice new skills, time to plan, interact with each other, and reflect on the processes being put into place. The authors' suggestions for creating time for teachers to meet include block scheduling, release time, early dismissal or late start days, year-round calendars, and extended contracts. When comparing the amount of student contact time spent by U.S. teachers compared to teachers in other countries, they state:

The public's expectations about teachers' use of time need to change in our country. Research and development time is necessary if teachers are to be effective while they are with students. Legitimate teacher work time is not limited to student contact time. (p. 67)

The last constraint identified is funding, closely aligned with the need to create time for teachers. It is expensive to cover classes for teachers who are out of the classroom working on professional development activities. While private corporations spend approximately 10% of their earnings on training and development programs for employees, Katzenmeyer and Moller report that school districts spend

only 0.5% of their budgets on professional development programs.

*Experiences of teacher leaders.* One of a principal's aims in creating total school action research teams was to promote teacher leadership among his staff (Harris & Drake, 1997). After the three-year process drew to a close, teachers were asked if they saw themselves as leaders. Their responses indicated that they continued to see leadership in terms of official position, such as team leader or department head. Their experiences in guiding and participating in action research teams did not manage to dislodge the traditional conceptualization of what a leader is and does. The authors believe this may have occurred because of several reasons: the teachers lacked a clear definition of teacher leadership, it was not identified originally as a goal of the process, and the school in the study maintained an official leadership hierarchy of department heads to whom all action research teams reported.

The definition of teacher leadership must be broadened, according to LeBlanc and Shelton (1997). For the study they conducted, teacher leadership includes: modeling an enthusiasm and a positive attitude; spending time on improving school life; working with others so student

learning is increased; and being recognized and valued for contributions.

The authors interviewed five teacher leaders to determine how the teacher leaders perceived themselves and others as they carried out their roles. Using need disposition theory to analyze the teachers' responses, the authors suggest that teacher leaders have two needs, the need for achievement and the need for affiliation, and that these two needs conflict. The need for achievement was noted in the statements of the five teacher leaders referring to their need for and enjoyment of lifelong learning; the need for affiliation was revealed through statements about the value they assign to teamwork and solid relationships with their peers. A lack of recognition for their efforts, at times coupled with jealousy from colleagues, undermined the strength of their affiliation, thus creating conflict. The study participants also reported that the most effective way for them to make an impact as a leader was through collaborative work with peers. As in other studies, the lack of time was the greatest barrier to teacher leadership.

There are differences in teacher leadership at the elementary, middle, and high school levels (Stone, Horejs, & Lomas, 1997). The authors conducted case studies of six teacher leaders from each of the three levels. Some similarities at all levels are: teacher leaders have more

years of teaching experience; they take on leadership roles for both personal and professional reasons and with a desire for greater involvement in decision-making; supports for teacher leadership include encouragement, time, decision-making, empowerment, and increased opportunities for professional development; time, power, and politics hinder teacher leadership; leaders' professional practice improves; and they help advance school improvement by ensuring that teachers' viewpoints are heard. The authors include specific recommendations for advancing teacher leadership at each of the three levels of schooling. They conclude that the success of teacher leaders depends on the nature of the school culture. Important constraints on its success are insufficient time and the egalitarian norm held by teachers.

The value of the push for teacher leadership is questioned by Leithwood and Jantzi (1999). They studied the relative effects of principal and teacher leadership on student engagement with school, referring to student attendance, motivation, participation, effort, and commitment. They found a weak but significant effect of principal leadership but no significant effect of teacher leadership. A very substantial proportion of the variation in student engagement was explained by the family educational culture, a measure of parents'/guardians'

interest in, knowledge about, and commitment to the student's school life.

Silva, Gimbert, and Nolan (2000) identify the characteristics of teacher leadership and barriers and facilitators to it derived from case studies of three teacher leaders. The three were third wave teacher leaders, leading from within their classrooms. The teachers' interviews revealed that one important characteristic they must be able to exercise is an understanding of how to work the system, "navigating" the structure of the school. They must be able to see the perspectives of both administration and the teaching staff, and know how to build support for changes. The importance of nurturing relationships so a supportive culture is created was also crucial. Teacher leaders have to model continual professional growth; they must also be skilled in helping colleagues to change. The idea of teacher leaders being viewed as co-learners rather than leaders was seen as a valuable approach. The final characteristic of the teacher leader was that of standing up for what is right for students; a strong ethical commitment to representing children's voices was identified as the teacher leader's most explicit role.

None of the three teacher leaders in this study felt they had been effective, and two of the three left their teaching positions. Silva, Gimbert, and Nolan (2000)

recommend: teaching preservice and inservice teachers about organizational theory so they can better navigate their schools; increasing principals' understanding of what shared leadership is; and changing the culture of schools so they are viewed as democratic communities rather than as hierarchies of authority.

*Section summary.* The authors and researchers mentioned in this section propose that a new understanding of leadership is needed to make organizations more effective; leaders must exist on every level of an organization. Teachers' participation in varied leadership roles will engage them in the change process, thus making change possible and long-lasting.

The role of the principal is crucial to the success of building teacher leadership. The principal can be one of the chief supports of teacher leadership building, or one of its chief barriers.

Some of the impediments to teacher leadership are: lack of time to work collaboratively; lack of funding; lack of support from building and/or district administrators; and egalitarian norms which result in a hesitancy to take on new roles that may change relationships with others.

Some factors which support and encourage teacher leadership are: time; training in leadership and

facilitation; development of communication skills; understanding of adult learning; support from administrators; professional development; and a supportive school culture.

### *Teacher Empowerment*

In the literature on teacher leadership a great deal has been written about empowering teachers. "Subsequent to the publication of *A Nation Prepared: Teachers for the 21st Century* . . . the term *teacher empowerment* has become one of the most used education buzzwords of the reform era" (Reitzug, 1994, p.284). Teacher empowerment commonly refers to the involvement of teachers in educational decision-making. Rinehart and Short (1994) explain that it has evolved from the belief that "those closest to existing problems have the expertise to solve them" (p. 571). Proponents believe the empowerment of teachers will improve the outcomes of schools, increasing the effectiveness of the organization, and will contribute to the level of job satisfaction in teachers.

A person is empowered when he or she has opportunities for autonomy, responsibility, choice, and authority (Lightfoot, 1986). Lightfoot believes empowerment is necessary for a school to be good, and offers three assumptions about empowerment: first, opportunities for

empowerment must be given to people early in their lives, beginning with children, and these opportunities should be matched to the maturity level of the age group; second, all members of a school must be empowered--students, teachers, and administrators; and third, empowerment is not a destination finally arrived at, but a dynamic process which is on-going and requires constant dialogue and reflection.

Lightfoot studied six schools which had been identified as good, based not only on tangible measures such as student achievement, graduation rates, attendance records and college entrance, but also on ethos and values, a whole portrait of characteristics. She found common themes across the six schools in her study; she reports the themes in terms of leaders, teachers, and students.

Leaders who are the most successful at empowering others and creating good schools are those who break the mold of the traditional paternalistic "person in charge". Empowering leaders share leadership with others in the school organization. Lightfoot also found that teachers are the "primary shapers of the educational environment" (p. 24). Their role is central to the quality of the school. As teachers learn and develop, so do students learn and achieve well. Finally, Lightfoot discovered that students succeed best in schools where the social structure rests upon

visible and widely-understood patterns of authority. Rules are established and accepted.

Rappaport (1987) writes about empowerment from his work in the field of community psychology. He defines empowerment as the individual's determination over his/her own life as well as that individual's participation in the life of the community. Empowerment is a process by which individuals and organizations can achieve mastery of their own affairs. Rappaport argues that the focus of studies of empowerment should be on the social and environmental context rather than on the individual level; an ecology of empowerment permits a better understanding of the broad range of role relationships which have an impact on individual actors. He also states that "empowerment tends to expand resources" (p. 142).

Similar to Rappaport's presentation, Prawat (1991) also distinguishes between the personal aspect (self) and the outward perspective (setting) of teacher empowerment. He describes empowerment as achieved through conversations with self and with setting. The teacher becomes empowered by first questioning expert "given" knowledge and traditional, authoritarian models of knowledge transmission. Gradually the emphasis on self is followed by insights into the larger context of society. The teacher then begins to consider the broader role of schooling and its relationship to society

and politics. Teachers become aware of "the power arrangements that deny them access to needed resources" (p. 752). Prawat believes that many case studies of teachers who collaborate are needed to understand how the empowerment process can improve teaching and learning.

For schools to really be able to change, teachers must be empowered (Whitaker & Moses, 1990). These authors provide a rationale for teacher empowerment. When teachers participate in decision-making they exercise greater creativity to solve school problems; the school's productivity increases. Enfranchising teachers prevents the alienation that often occurs when people feel powerless to effect change; it also counteracts the mindlessness typically found in bureaucratic top-down organizations. Empowered teachers challenge that mindlessness and stimulate action. They continue learning; professional renewal is critical to attempts to stimulate innovations. Empowerment also stimulates the collaborative relationships which are needed to restructure schools.

Short and Rinehart (1992) describe six dimensions which measure teachers' perceptions of empowerment:

1. Decision-making: this refers to teachers' participation in decisions which have a direct impact on their work, such as budgeting, school

- schedules, curriculum, and teacher selection and assignment.
2. Professional growth: this dimension measures teachers' perceptions of the opportunities their school provides for them to continue learning and growing as professionals and to improve their teaching skills.
  3. Status: this measures the extent to which teachers feel they are respected, admired, and supported by colleagues; their knowledge and expertise are acknowledged by others.
  4. Self-efficacy: this refers to how competent teachers believe they are in terms of the skills and abilities needed to help students learn and to design effective instructional programs.
  5. Autonomy: this dimension measures the degree of freedom teachers feel to make certain decisions affecting their work lives.
  6. Impact: this refers to whether or not teachers feel they have an effect and influence on school life (Short, 1994).

Using these factors, in 1993 Short and Rinehart studied the relationships among teachers' perceptions of school climate, their perceptions of empowerment, and demographic information. They found that school climate, years of

experience, and teachers' age were statistically significant predictors of teachers' perceptions of empowerment. They found a negative correlation between school climate and empowerment: as teachers' perceptions of empowerment increased, they perceived a less positive school climate. Because the schools in the study were involved in restructuring efforts, the authors believe that there were increased instances of conflict which would not have become apparent within more traditional school structures, thus leading to dissatisfaction with the school climate. They suggest that as teachers are given more opportunities for empowerment, they must be trained in effective communication skills and in positive methods of resolving conflict.

Rinehart and Short (1994) also studied the relationship between job satisfaction and teacher empowerment. They looked at teacher leaders who worked full-time for the Reading Recovery program, another group of teachers who spent half a day working in the reading program and the other half in the regular classroom, and full-time regular classroom teachers. The researchers found that full-time Reading Recovery teacher leaders perceived a greater sense of empowerment and satisfaction than did the teachers in the other two groups. They believe the teacher leaders' yearlong training in coursework and mentoring may account for their greater sense of both satisfaction and empowerment.

Is teacher empowerment associated with a greater capacity for organizational learning? Marks and Louis (1999) looked for evidence of this relationship. They had previously worked on studies in which empowerment was found to be an important predictor of professional community among teachers (Louis, Marks, & Kruse, 1996) and in which professional community is strongly associated with high quality teaching and students' sense of community and inclusion in the school setting (Louis & Marks, 1998). In the 1999 study, they found a consistent relationship between the capacity for organizational learning and teacher empowerment, with especially strong results in the areas of teaching and learning. The authors suggest that if schools are involved in restructuring efforts and are given autonomy, there must then be a concerted effort to build the internal relationships among members of the school community, "reforms of culture" (p. 732).

Using data from the study of New Jersey middle schools mentioned in a previous section, Sweetland and Hoy (2000) considered if a relationship existed between school climate and teacher empowerment, and then between teacher empowerment and school effectiveness as measured by students' math and reading scores on standardized tests. They found that the strongest climate predictors of teacher empowerment are collegial leadership (the principal is

supportive of teachers and egalitarian) and academic press (a school-wide focus on academic goals to which teachers and students commit). With respect to school effectiveness, empowered teachers perceived their schools to be more effective than teachers in schools where teacher empowerment is not found; student achievement in both reading and mathematics was found to be significantly higher in schools with empowered teachers, even when controlling for socio-economic status.

Policy strategies intended to empower teachers were studied by Keedy, Winter, Gordon, and Newton (2000). One strategy they studied was teacher collegial groups. The facilitators of these groups were teacher leaders who organized study groups of 6 to 8 teachers; the teachers designed plans to improve their own classroom instructional programs through action research. The researchers determined that these experiences can empower group members when the facilitating teacher approaches the task as a co-learner and supporter of classroom experimentation, and when the facilitating teacher is chosen carefully based on his or her ability to establish collegial relationships with peers.

Keedy et al. (2000) also report that another policy strategy, professional development, has great potential to both empower teachers and to improve student outcomes. Fifteen high-performing professional development programs

were identified, based on their conformance to research-derived characteristics of effective professional development from the literature and their effectiveness in empowering teachers, improving teachers' instructional effectiveness, and increasing student academic achievement. The attributes common to the 15 programs were: an atmosphere of support and trust between teachers and leaders; expectations (realized) that leadership roles would be filled by teachers; voluntary participation in the professional development accompanied by high levels of participation because a cultural norm had been created which supported this; learning activities which focused directly on classroom practice; and the integration of professional development goals into a coherent and comprehensive program. In the schools observed in this study, professional development had become a "way of life"; "PD was considered the indispensable, integrating force for (a) teacher development, (b) the improvement of teaching and learning, and (c) continuous school renewal" (p.17).

*Section summary.* Teacher empowerment refers to giving teachers increased opportunities for autonomy, responsibility, and authority. As an individual gains more determination over his or her own life, that person participates more actively in the life of the community.

There is thus a shift from self to setting, leading to more willingness to work for change.

Researchers have found that empowered teachers experience greater job satisfaction, and there is an increased capacity for organizational learning. There is some indication that empowered teachers can have a positive effect on student achievement. The professional development of teachers can empower them and can also improve student outcomes.

#### *Summary of the Literature*

This quote from Wasley (1991) describes the school practitioner's typical workday:

. . . The day is very full from the moment teachers park to the minute they back out: kids swirling around with 100 different questions, needs, personal stories to tell; mailboxes full of literature that needs sorting, reading, trashing; forms that need filling out, filing, returning; committees to sit on, conferences to schedule; phone calls to make to parents; field trips to organize, evaluation conferences with principals, not to mention lessons to prepare. . . . Teaching simply is not designed to support thoughtful reflection about practice or conversations among adults that would promote professional growth. (p. 186)

Within the busyness of that workday, what can be done to achieve significant and lasting change that results in increased student learning? School change, school culture, teacher collaboration, teacher leadership, and teacher empowerment--although presented separately in this review of

the literature, in the daily lives of schools, teachers, and children, their manifestations are all inextricably linked together. Several themes expressed in the literature of these topics occur over and over:

- The school is now understood to be a highly complex social system.
- Changes in schooling are needed in order to respond to the rapid changes the larger society experiences.
- Change efforts often do not succeed because they ignore the culture of the school.
- The school culture is shaped by the underlying assumptions people hold about the structures of school, and the human relationships and roles within them.
- To create sustainable change in schools, new cultural assumptions must be formed.

What must be the bases of new cultural assumptions that will support sustainable change? Other frequently mentioned themes in the literature are:

- Collaboration among teachers is critical; norms of individualism and egalitarianism must shift to a commitment to the sharing of technical knowledge and the ongoing scrutiny of practice with careful reflection.

- Structural changes in schools and districts are necessary to provide the time for collaboration.
- New understandings of leadership have emerged: leadership is a shared endeavor.
- Teacher leaders need training in leadership skills and interpersonal processes.
- Empowered teacher leaders can bring about changes in instruction and learning.

This study will explore the experiences of teacher leaders who attempt to lead their colleagues in efforts to improve teaching and learning.

## CHAPTER 3

### METHODOLOGY

This chapter describes the methodology employed in a study of teacher leaders and their efforts to establish collaborative structures and relationships at their school sites. The sections are:

- The General Perspective
- The Research Context
- The Research Participants
- The Instrument Used in Data Collection
- Procedures Used
- Data Analysis
- Summary of the Methodology

#### *The General Perspective*

This study employed a qualitative methodology to explore and understand participants' experiences in a school change effort and the meanings they attach to those experiences. This perspective "emphasizes a phenomenological view in which reality inheres in the perceptions of individuals" (Glatthorn, 1998, p. 34). This view was gained through interviews.

The type of research was the case study. Glatthorn (1998) characterizes the case study as providing "a detailed description of a particular situation, organization,

individual, or event . . . a disciplined inquiry concerned with illuminating meaning by using inductive processes" (p. 76). The individual experiences of several teacher leaders were examined and compared; thus several case studies of individual participants are "layered or nested within an overall primary case approach," as described by Patton (1990, p. 298), the overall case study being teacher leaders' roles in the context of a federally funded change effort.

The research questions were:

1. What factors do teachers identify as contributing to their success as leaders?
2. What factors do teachers identify as standing in the way of their success as leaders?
3. Is there evidence of empowerment of the teacher leaders? If so, how do they express that empowerment?
4. What effect does the school culture have on teacher leaders' efforts to change science teaching and learning?
5. How are collaborative structures and relationships established at a school?
6. How do collaborative structures and relationships become sustained over time?

### *The Research Context*

The teacher leaders in this study are employed by a large urban school district in the Southwest. During 1996 and 1997 the science curriculum specialists who worked at the district's science resource department developed a proposal for a local systemic change grant from the National Science Foundation. A \$5.6 million grant was awarded to the district, to be implemented between 1998 and 2003. The Science Education Reform Project, referred to as SER, was a K-8 grant; the grant was written to include all 76 elementary and 19 middle schools in this effort.

The vision of the SER Project was to implement the National Science Education Standards by engaging all students in learning science through inquiry and hands-on activities (learning by doing). This vision included: relevant and real-world science application; depth vs. breadth; concept-driven science content; the teacher as facilitator; and students taking responsibility for their own learning (National Science Foundation, LSC Award #9731898).

The Standards promoted science teaching which moved away from traditional, cookbook-type science labs and learning, in which questions, procedures, and conclusions are already determined, to a constructivist model referred to as inquiry learning. The inquiry model focuses on the

child, beginning with his/her own experiences and prior knowledge, and seeks to enhance the child's natural curiosity and expand his/her understanding through authentic experiences with a variety of phenomena. The goal is to increase "students' ability to think and to use observations and knowledge to formulate scientific explanation" (Bybee, 1997, p. 111). It includes but goes well beyond the process skills of observing, inferring, and developing and testing hypotheses. Rather than cover many topics in a superficial fashion, teachers are encouraged to delve into fewer topics, leading students to a deeper conceptual understanding of important scientific ideas.

The requirements of the grant specified the professional development of all K-8 teachers: elementary teachers, grades K through 5, had to receive 100 hours of professional development in science instruction over the life of the grant, while middle school teachers, grades 6 through 8, had to receive 130 hours. There was also a requirement of 100 hours of professional development for the K-8 principals and support or resource teachers, such as librarians, curriculum specialists, or special education teachers.

Schools were organized into cohorts, referred to as Cohorts One, Two, Three, and Four. For example, Cohort One, the first group of schools to participate in the Project,

consisted of thirteen elementary schools and seven middle schools. All middle schools would complete their institute participation during the first three cohorts. Schools had to apply to participate in the Project.

In addition to the four leaders at the science resource department, nine teachers were recruited from within the district to work full-time for the Project. They were referred to as collaborative teachers. Seven of these worked only with elementary schools, and two with mostly middle schools and some elementary schools.

Each school chose a science facilitator, a full-time teacher who would serve as liaison between the science teachers on staff and the SER Project. These facilitators were selected in a variety of ways: by the principal, by the principal and a group of teachers, by the teachers only, or by someone volunteering. In several middle schools, this role had existed before the grant began, as the science department head or chairperson. With the SER Project in place, the science facilitators' role was to disseminate information, help lead the process of improving the science instruction at their school, and work toward a system of sustaining the changes brought about by the Project's efforts. A series of monthly meetings took place for science facilitators at which they were introduced to the Project, its goals, and their roles.

During the first year of the Project, the collaborative teachers and Project leaders worked on a design for the professional development of K-8 teachers. Their design centered around two main components: a series of two summer institutes of four days each, one during each cohort's first year of participation, and a second one during the second summer, and a series of learning forums held at each school.

The first summer institute was designated the Leadership Institute. Its goal was to familiarize teachers and principals with the characteristics of effective science instruction as described by the National Science Education Standards (1996).

Another focus of the Leadership Institute was for the science team from each school to develop a plan of action for the following year. Each team also planned ways to communicate what they had learned at the Institute to the rest of the teachers who had not attended.

Between those first and second summer institutes, the collaborative teachers worked intensively with the current cohort schools. The format for that work was referred to as learning forums; these were done six or seven times for each school, and each forum lasted approximately two hours. The Project paid for specially trained support personnel to go into classrooms and teach science lessons while the teachers were released to work together on-site with the

collaborative teacher. During the forums, teachers worked on the elements of effective science instruction. They participated in discussions on the importance of questioning in the classroom, and learned about the different kinds of questions that are used. They also had some experiences with inquiry investigations to learn how to move along a continuum from entirely teacher-directed instruction to more student-initiated learning

In the case of some middle schools, a portion of the learning forums was dedicated to establishing a scope and sequence of science lessons, a school-wide plan for what would be taught in science classes. For a variety of reasons, the instructional materials adopted for middle school in 1993--a non-traditional textbook which had an inquiry format--had not been well-received by some of the science teachers. Materials needed to continue using the text after the initial adoption were not always available. The consequence was that teachers had tended to develop their own instructional units and "do their own thing." The creation of the scope and sequence was thus an effort to introduce greater coherence to the science program. If not addressed during the learning forums, the scope and sequence was worked on during study groups or science department meetings.

At the second summer institute, named Next Steps, the focus was on assessing student learning. The differences between formative and summative assessment were highlighted. Teachers delved into the use of student science notebooks, looked at the different modalities students can use to demonstrate learning (writing, discussing, drawing), and carefully studied samples of student work to try to understand how to address and modify student misconceptions. Again, the science team planned how to communicate this information to all the science teachers on staff; they were given time to design a pre-service day for all teachers to attend before the start of the school year.

During the second summer of the Project's work, a third institute was added to the program. This was the Inquiry Institute. It provided teachers with an extended experience in inquiry as learners themselves, so that they would better understand how to use the process with their own students.

In addition to these experiences, there were weekend seminars and workshops sponsored by the Project, study groups at the schools, often led by science facilitators, science content courses offered at night or on weekends, and visits to state, regional, and national conventions of the National Science Teachers Association.

*Additional influences during the year of the study.* The year in which this study was conducted was one in which district and state policies introduced a great deal of turbulence into the system. At the district level, the central administration identified seventeen schools as underachieving; a special program to improve student achievement scores in those schools was brought into the district from another state. This program entailed many changes in instruction and schedules as personnel worked on the development of instructional calendars which stressed the basic skills found to be most lacking in the student population of each school. One of the study participants taught in a middle school labeled as underachieving.

The second policy with many effects on the schools was a mandated early release day; every Wednesday, students were dismissed earlier than usual and the time after they left was to be dedicated to the professional development of the teaching staff. For most schools it was a big departure from the normal flow of the school week. Some schools had already been doing an early release Wednesday, but they, too, had to change what they had been doing in varying degrees.

Budget constraints were another big factor; funds for many basic supplies were very limited. In addition to the effects on the classroom, there was a lot of finger-pointing and criticism at the community level and in the media.

Two state initiatives were introduced during the same year. First, a new state law changed bilingual education programs to a model which required mastery of English before students could be placed in bilingual classrooms. This English immersion model often required a shifting around of teachers' schedules, and also mandated professional development for teachers in instructional techniques for second language learners under the new program. Second, state voters passed a proposition which put more money into the school districts for the purpose of raising teachers' salaries. While an across the board raise was instituted, each school also received some funds it could assign to individuals for leadership or mentor-mentee roles. The sites were to determine how those funds were allocated.

All these factors brought some degree of stress and confusion to the schools and personnel.

*The researcher's role.* Patton (2002) states that information about the researcher's experiences and perspective should be reported because of its possible effects on data collection, analysis, and interpretation (p. 566). One year before the SER Project grant was awarded to my district, I became the science department head for my middle school. I was invited to take on that role by the science teachers. At that point, I had been teaching in

American public schools for 14 years, most of them at the middle school level, and four years at an elementary school.

I was thrilled to be offered the position! Although I did not have a degree in science, I loved teaching it. I had taken many science courses to learn more and became certified in general science for grades K-12. I had participated in many professional development workshops, and had traveled to national, regional, and state conventions to do presentations on ways to teach astronomy and the planetary sciences. I was eager to take on the leadership role.

My school applied to become a Cohort I school when the SER Project was first introduced, and it was accepted. I participated in the summer institutes, learning forums, and workshops described in the interviews. At my school, I began work with the science teachers on an initial scope and sequence of science instruction for the school. I led an after-school study group on the use of a protocol for looking at student work for one semester and another group on teacher action research for two semesters. I also did an administrative internship with the Project principal investigator.

During the third year of the SER Project, the middle school science curriculum specialist who worked at the district science resource department went on to an

administrative position in a district school. I then took on that role, leaving the classroom.

As middle school science curriculum specialist, I work extensively with the science facilitators described in this study. Several of them were my colleagues for the Cohort 1 programs. Several of them have worked on the middle school instructional materials adoption committee which I have headed for the past two years. Although I am no longer a classroom teacher, most of them knew me first in that context and think of me as a peer. In my current position, I have no authority to hire or fire. I believe the study participants were interested and eager to be a part of the study, and were very open, honest, and thoughtful in their responses. I was very conscious of the need for "empathic neutrality" (Patton, 2002, p. 50) on my part, showing my interest in their stories while remaining completely non-judgmental.

#### *The Research Participants*

There are 19 middle school facilitators. Two of these were invited to participate in pilot interviews before the formal research interviews were begun (Seidman, 1991, p. 30). The purpose of the pilot interviews was to practice conducting the interviews: using the tape recorder, taking notes, and identifying any difficulties or misunderstandings

that might occur because of the wording of the questions on the interview protocol. One of the pilot participants was selected because she is in a co-facilitator role with another more experienced facilitator. The other pilot participant assumed the facilitator role when I left her school; she inherited my job and so had less time in that position. In both cases, I felt they would have valuable insights and would be helpful in making suggestions for improving the protocol.

The process I followed to choose the interview participants involved the recommendation of experts, as described by LeCompte and Preissle (1993). I combined their strategy of ideal-type case selection (p. 77), in which the researcher develops a profile of the most effective example of some group to determine who to interview, with their strategy of extreme case selection (p. 75), in which a norm for some characteristics of interest is developed and all possible cases are arranged on a continuum.

First, at a weekly meeting of the staff of the SER Project, I asked collaborative teachers and the Project leaders to describe the characteristics of effective science facilitators. They provided a lengthy list of descriptors. From that list, I summarized and classified thirteen descriptors into three general areas: personal

characteristics, professional knowledge, and actions as a science facilitator.

The second phase was to develop a one-page form to be used by the two middle school collaborative teachers and myself to rank the facilitators. (See Appendix A.)

Because each of the two middle school collaborative teachers worked intensively with half of the middle schools, they had more knowledge about the facilitators from their schools than they had about the others; however, from the summer institutes, meetings, workshops, and courses, they had some knowledge of all the middle school facilitators and therefore, I asked them to fill out the forms for all 19 facilitators.

After the two middle school collaborative teachers and I had rated the 19 facilitators using the form shown in Table 2, the mean score for each facilitator was calculated. A response of "don't know" counted as a zero. I placed the scores on a continuum from the lowest to the highest. (See Table 2.) The first column of Table 2 displays the mean scores earned by the 19 facilitators. The second column shows how many facilitators earned the corresponding number of points. The last column shows the number of facilitators who were interviewed at those points from the continuum of rankings.

Table 2

*Science Facilitators' Rankings and Sampling  
of Study Facilitators*

Average Points Earned	Number of Facilitators At Each Ranking	Number Selected For the Study
21	1	0
22	1	1
23	0	0
24	2	0
25	2	0
26	2	1
27	2	0
28	1	1
29	1	1
30	1	0
31	0	0
32	1	0
33	0	0
34	0	0
35	1	0
36	2	2
37	0	0
38	3	2

At the time of this study, Cohort Three schools were just beginning their second year in the SER Project. I felt it would be more informative, and fairer, to select the interview participants from Cohorts One and Two only,

because they had had more time to work together and had more experiences from their longer participation in the Project.

I eliminated two facilitators from Cohort Two because their science staffs are very small (three teachers each). I then chose eight facilitators to interview from several points along the continuum of rankings. I decided to interview four of the facilitators who had received the higher rankings to see if there were commonalities in the experiences of those facilitators perceived to be more effective. These eight represent schools with very similar numbers of science teachers, from six to eight. I contacted them, and all agreed to participate in the study.

#### *The Instrument Used in Data Collection*

I developed the interview protocol based on the format recommended by Seidman (1991). He writes, "At the heart of interviewing research is an interest in other individuals' stories because they are of worth" (p. 3). The goal of this type of research is to understand the meaning of those stories. What do the facilitators' stories tell about their experiences leading others through joint work at improving teaching and learning?

The protocol reflects the structure of the three-interview series described by Seidman. The first interview

is a focused life history: the participant tells "as much as possible about him or herself in light of the topic up to the present time" (p. 11). I wrote questions that would give information about the teachers' past experiences leading up to the present: how and why they became teachers, what they studied, where they had worked, how they had arrived at their current position and role as teacher leader, and what their past involvement with the Project had been.

Seidman refers to the second interview as the details of the experience, and its purpose is to elicit the concrete details of what they currently do; therefore, the questions in this part of the protocol are about the teachers' current work as facilitator and leader of science teachers. The third interview is a reflection on past and present, in which the participants make sense and meaning of their experiences; my interview questions in this section focus on the facilitators' understanding and interpretation of the work in which they have participated.

Within this framework of past, present, and reflection, I wrote protocol questions based on what I have read in the professional literature about school change, school culture, collaboration, leadership, and empowerment.

For the format, I used a combination of two approaches described by Patton (2002): the interview guide approach, in

which the topics to be covered are decided in advance, although the sequence and wording of the questions may vary; and the standardized open-ended interview, in which the questions' exact wording is determined in advance, and all the participants are asked the same questions in basically the same order. I made an effort to have questions be as open-ended as possible, except when very specific details were needed, as for example, in asking about which teachers had participated in Project-sponsored activities.

After some of the questions, I listed probes, reminders to myself about information I wanted to elicit if the participants did not offer that information when responding to the open-ended questions. To gain some idea of the school culture, the factors of school culture, as described by Gruenert & Valentine (1998), were used to frame the probes. The interview protocol is shown in Appendix B.

### *Procedures Used*

After obtaining permission to conduct this study from my dissertation committee, the University's Human Subjects Review Board (see Appendix C), and the school district in which these teachers work (see Appendix D), I first invited two of the facilitators to do the pilot interviews. One of the chief pieces of information I needed was the time it

would take to complete all three parts of the interview sequence. Although Seidman (1991) generally recommends doing three 90-minute interviews, I found from the pilot interviews that two interviews were sufficient. Seidman states, "As long as a structure is maintained that allows participants to reconstruct their experience within the context of their lives, alterations to the three-interview structure and the duration and spacing of interviews can certainly be explored" (p. 15).

These pilot interviews were also useful in helping to refine the interview protocol. I realized I needed better probes for getting at the factors of school culture; in some instances, such as "learning partnership", I had used jargon which had little meaning for the participant, so the wording of the questions and probes was modified to make them clearer. I rephrased the probes to avoid yes/no responses. I realized I needed a definition of "collaboration" and "leadership" from them because I felt their understanding of these would be of interest, so these questions were added.

The pilot interviews helped me gain practice in pacing the interviews and giving the participants enough time to pause, think, and then speak. I also realized that participants had different ways of reacting to the interview, and I had to respond to those differences by

either giving more prompts and rephrasing questions, or giving fewer prompts and letting them go on to where they wanted. One of the pilot participants became very nervous with the tape recorder running, and asked that it be turned off; this was the only instance in which tape recording was not used.

With changes to the protocol made, I contacted the eight facilitators I had selected for the interviews and scheduled the times. The interviews were conducted in a small conference room in a district building which houses the science resource department. I first gave each participant an overview of the nature of the study and explained the paperwork describing his/her rights and responsibilities, as required by the university's Human Subjects Review Board. After reading the consent form, the participant signed and was given a copy. I then began the interview, both taping it and taking some notes on my copy of the protocol questions.

The interviews were conducted during summer break and were scheduled at the participants' convenience. All eight participants were interviewed twice. The first interview, which generally lasted 90 minutes, covered Part I and most of Part II of the interview protocol. The second interviews were conducted within three to seven days after the first,

and covered the rest of Part II and Part III, the reflection. The second interview lasted from one hour to 90 minutes. All the participants proceeded through the same protocol, but I took several detours from it when facilitators mentioned something I felt needed to be explored further. The sixteen interviews were conducted over a time span of four weeks.

After each interview, I made note of anything they said which seemed to be important, interesting, or just curious, and might develop as a theme of the research. Before the second interview with each participant, I re-read these notes and the notes I had made on the protocol of the first interview; if I had questions I wanted to clarify or explore further, I began the second interview with those, and then went on to complete the protocol questions.

I transcribed the tape recordings verbatim. Patton (2002) points out the value to the researcher of doing his/her own transcriptions; it "provides an opportunity to get immersed in the data, an experience that usually generates emergent insights" (p. 441). When all the transcriptions were complete, I played all the tapes over again, and checked the transcriptions against the tapes. I also re-read my notes one more time, and then went on to the analysis of the data.

### *Data Analysis*

The interviews of the eight science facilitators produced almost six hundred double-spaced pages of transcriptions. To derive an understanding of the multiple issues found in the science facilitators' stories, the researcher engaged in content analysis, "a reduction and sensemaking effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings" (Patton, 2002, p. 453).

Patton states that core meanings are called patterns or themes. A pattern is a descriptive finding; many examples of a pattern that reoccurs will lead to the uncovering of a theme. This is an inductive process. For example, all participants made frequent mentions of their grade level teams. In my mind, "team" became a pattern I looked for in participants' responses. When I linked that pattern with descriptions of the science staffs at each school, I came up with a theme: the possible tension between the middle school model, based on the grade level team, and the focus of the SER Project on one specific academic subject area.

Several steps were involved in the analysis of the data. I did an initial reading when I compared the transcripts to the tape recordings. I then re-read all eight, making notes in the margins of possible patterns or

themes. From these margin notes, I developed a list of themes that I saw. Patton (2002) refers to this process of looking for what things fit together as convergence, or "recurring regularities" (p. 465).

Once I had developed the list, I asked a colleague to follow the same process by reading through four of the transcripts and coming up with themes by himself. I chose the four transcripts from along the continuum of the facilitator rankings. I deleted names of all persons and schools from the transcripts to protect the identity of the study participants. My colleague compiled a list of themes he had identified and we compared our lists. Patton (2002) writes, "Important insights can emerge from the different ways in which two people look at the same set of data, a form of analytical triangulation" (p. 464).

There was a large degree of agreement between my list of themes and my colleague's. After discussion, I came up with a final list of themes. They were: central staff, referring to the Project and science resource department personnel; change and resistance; collaboration; the effect of district policies; effects of the Project; inquiry teaching and learning; leadership; the middle school model; resources for teaching science; new teachers and mentoring; the physical setup of the placement of science classrooms;

the principal; professional development; the effects of belonging to a group of middle school science facilitators from the entire district; the scope and sequence for middle school science; the role of site-based councils; time; and turnover of teachers and administrators.

Each of these themes was written on a large sheet of blank paper. I went through all the transcripts again, using post-it notes to record topics or labels which I had written in the margins. On each post-it note, I wrote the number of the participant and the page number of the interview transcript in addition to the label I had given it; for example, "Participant 4, p. 27, principal". I then displayed all the post-it notes with similar topic labels on the corresponding labeled sheet.

Some of the topics had many more post-its than others. I took these and classified them into sub-topics. For example, "leadership" was subdivided into "understanding of leadership", "training in leadership", "role as a teacher leader", and "building leadership in others". Several of the themes were closely related, such as "turnover" and "new teachers/mentoring", but I decided to keep them separate.

The final step was to relate the themes to the six research questions. Although much of the information is highly interrelated with more than one theme embedded in the

facilitators' responses, I tried to assign specific themes to specific research questions in order to make the presentation of results clearer. Thus, for example, to answer question 1, what factors do teacher leaders believe contribute to their success, I identified support from the principal, the other science teachers, central staff, and the group of district science facilitators as important. Other factors which had been identified as themes and which also seemed to help the teacher leaders become successful were the effects of the work done by the Project, and professional development in general, and the development of a scope and sequence for science instruction. Patton (2002) refers to this process as divergence, when "the analyst extends the data by making connections" (p. 466).

I followed this process for each of the remaining research questions. Using the topic sheets, I went back to the transcripts, read again what the facilitators had said, took notes on their responses, and then wrote a section for each research question. I grouped together participants' responses on each topic to get an overall sense of how each of their pieces of information fit into a meaningful response to the research question; this is "cross-case analysis" as described by Patton (2002, p. 440).

*Summary of the Methodology*

This chapter explained the methods used in a qualitative study of the experiences of teacher leaders as they worked to establish collaborative structures and relationships at their schools to improve the teaching and learning of science. The following chapter presents the results obtained.

## CHAPTER 4

## RESULTS OF THE STUDY

This chapter presents the results of a study of the experiences of teacher leaders and their efforts to improve the quality of science teaching and learning at their schools as they attempted to establish structures and relationships which would encourage greater collaboration among science teachers. The chapter begins with a brief introduction to the eight participants. The names of all persons and schools have been changed. The results of the study are then presented using the six research questions as the organizer. The research questions were:

1. What factors do teachers identify as contributing to their success as leaders?
2. What factors do teachers identify as standing in the way of their success as leaders?
3. Is there evidence of empowerment of the teacher leaders? If so, how do they express that empowerment?
4. What effect does the school culture have on teacher leaders' efforts to change science teaching and learning?
5. How are collaborative structures and relationships established at a school?

6. How do collaborative structures and relationships become sustained over time?

### *The Participants in the Study*

*Karen.* Karen has over 10 years of teaching experience, and has been at her present school for the past eight years. Her undergraduate major was English with a minor in earth science. Her master's degree is in educational leadership. In addition to being the science facilitator, she is serving on the site-based council, and during the past school year was responsible for scheduling the professional development program for the whole staff on the early-release Wednesdays. She characterizes her school's staff as "easy-going" and "close-knit". The science teachers, whose classrooms are all interconnected in a six-classroom pod, are friends. She enjoys working with middle school students very much.

Karen now recognizes that she has been a leader for some time; her husband's career took the family overseas, and because of his position, Karen found herself the unofficial leader of a group of wives. "I played mother for a lot of wives in distress" she says of this experience. It was "on the job training"; she learned as she went along.

She sees leadership as a facilitating process: helping people improve by guiding them to find the means of reaching the goals they've set for themselves. The leader has to

"make sure the job gets done to the best that it can get done."

Karen expresses some concerns about being called a leader: "the word leader is almost a scary word to me". She recalls that in high school a teacher told her she just wasn't the leader type, that she was the worker bee. That memory remains vivid, but she states, "I have figured out over time that I have basically what's needed, just being willing to get the job done."

*Margie.* Margie has taught for over 30 years. She has a bachelor's degree in physical education, two master's--one in education and one in therapeutic recreation--and a doctorate in curriculum and instruction. Although friends have questioned why she stays at middle school with the number of degrees and the experience she has, she enjoys her work with middle schoolers, and is interested in seeing through the effects of a recent plan to loop teachers from seventh to eighth grades, following the same group of students through those two years. She describes her school as a very culturally rich and diverse school, and the staff as a warm teaching community.

Her leadership experience includes being the chairperson of her department when she taught in high school, serving at the county level in her teachers'

professional association in another state, and being on her school's site council. Margie received leadership training from the professional association and some training from the district for serving on the site council.

When asked to define leadership, Margie responded, "the positive essential that makes people cohesive for a goal." Referring to her work as facilitator, she reminded me that "facilitate" comes from the same root word as the word for "easy" in Spanish, so the facilitator/leader makes things easier for people, helping them find how to do things and where to go for more help. She is the information director and the gate-keeper, ensuring that everyone in the group is heard from and is given the chance to participate.

*Jim.* Jim has 20 years of teaching experience, eleven years at the middle school level, and nine years in high school. His undergraduate major was anthropology; his master's is also in anthropology, and he did a post-baccalaureate program to become certified as a teacher. He likes working at the middle school level because he believes it is the age at which children change the most; it is "the last chance you get to really turn kids around." From his anthropology studies, he sees that the age is important

across all cultures: "the coming of age - lots of things are happening."

Jim has leadership experience and training from his years of service in the military, from teaching and organizing scuba diving and diving trips, and from teaching the martial arts and coaching soccer. He defines leadership as looking at the resources present, the people you have, and then seeing how the mission can be accomplished with those people and resources. "And that sounds simple, but it's really a lot, because you've got to get them to buy into it first of all, you've got to get them to work together."

Jim's school was one of seventeen identified as underperforming by the district's central administration. Jim left the science facilitator position mid-year to concentrate on his work with the newly-instituted site council. He had been science facilitator for the past six years.

At the end of the last school year, after working 10 years at the same middle school, Jim transferred to a different middle school because of conflicts with a new principal.

Carla. Carla has also taught for 20 years. She has a bachelor's degree in history and a master's in biology education. She has been at her present school for the past 12 years. She describes her school as very team-oriented. It is a close-knit staff, "a real working community." She came to middle school science because her first job with the district was as a substitute for a science teacher; she has stayed at this level because she likes it. "Somebody has to love those children" she says, laughing.

She has experience in leadership from when her own children were younger and participated in sports and other activities. Carla was a den leader for Cub Scouts, a player agent for Little League, and served on the board of directors for Little League. In her college days, she was an officer for her sorority. She also served for 10 years on her school's site council.

Although she had no formal leadership training prior to the SER Project, she has "self-taught training" from the teaching she does at night for a business college. When asked to define leadership, she made a distinction between leading and managing. "You can't manage, you really have to lead and that's the key source to growth, brainstorming and coming to a consensus . . . it's more of an empowering your peers to take a risk, to volunteer their ideas without any

fear of threat or putdowns, which makes everything better because many heads are better than one."

*Linda.* Linda has been teaching for five years. She has a bachelor's degree in elementary education. Before becoming certified, she held a number of other positions in the schools over the course of about 10 years, as a playground monitor, a cafeteria worker, then teacher's aide, and volunteer. She believes that her experiences in seeing the schools from these various perspectives made her teaching easier, even in her first year.

She became a science teacher because she originally was hired for a self-contained classroom and had to teach all subjects. She enjoyed teaching science, and switched to a science/math position after one year. She loves middle school, especially the sixth graders. "They haven't gone through that change (to) the dark side where the hormones kick in. They still have a caring gentleness about them."

Linda has some leadership experience and training. In a different district, she worked on a committee that wrote the district curriculum plan for all subjects. She is also active in the teachers' professional association, both at the district and state levels. She has received leadership

training for her leadership roles from the state professional association.

She describes leadership as setting a goal, getting people to follow, communicating, having information to steer people in the right direction, being honest and trustworthy, and getting people's respect.

After three years as science facilitator, Linda passed the role on to another teacher at the end of the school year; she also switched to language arts, leaving her science/math teaching assignment.

*Marianne.* Marianne began her university studies as a metallurgical engineering student, but switched to elementary education after she took a position as a computer technology aide in her own children's school. With many credits in a master's degree program, she recently began a doctoral program in curriculum and instruction and will finish within one or two years.

She came to middle school because she wanted to teach science, math, and technology. She has taught at the same middle school for 13 years. Overall, she likes her school, which is why she has stayed this long; she describes it as a "real high energy place" and "a very unique environment."

She described the staff as close and supportive of each other.

Marianne has leadership experience and training. She has been science facilitator for six years. She teaches pre-service courses for a local college, and she is a master teacher for several technology training programs. She has worked for many summers as site administrator for a summer school program for children. Marianne was trained in adult education for her technology programs, and through the district, she received training in how to lead study groups.

She defines leadership as a combination of people skills, having the background and knowledge in the area you are attempting to lead, and the ability to work with colleagues and gain their respect and support. "It isn't something that's imposed on people, it's a building process."

For the coming school year, her school will be welcoming the fifth principal in six years, the previous principal and both assistant principals having left. Because of teacher and parent dissatisfaction, a restructuring effort for her school got under way during the spring semester of the past school year. Marianne is one of the leaders of this effort. She and her committee worked all

summer on a design for their school, based on *Turning Points 2000*.

*JoAnne.* JoAnne has been a teacher for 22 years. She was an art major, but with an interest in art therapy and special education, she switched to elementary education. Her master's degree is in special education.

JoAnne worked with severely emotionally disturbed students at a middle school in another state; she enjoyed this experience, and when the chance to teach middle school science came up in this district, she took it. She had a love of science dating back to some of the courses she took as an undergraduate, and her husband is a scientist.

Earlier in her career, she was a team leader for special education, and also worked as committee leader for her site-based committee in another state. She received extensive training for that position--a 10-day national training program brought in by a district she used to work in. Currently, she is the leader of the curriculum committee at her school, and is in her third year as science facilitator.

Leadership is "not just dictating." A good leader helps others, providing assistance, direction, and opportunities

for others, setting the stage for people to be successful, "kind of like being a parent."

JoAnne describes her school as having a very positive atmosphere. Teachers are very caring of students, whose needs are put first. "Our school has a fairly tough population, as any middle school is", but "It's a good school. Our classroom doors are open to each other." She attributes much of this to the current and former principals of her school: "When John was there, our focus was getting the kids under control. Where our focus now is, we've got the kids under control, now we can teach." She considers the current principal an exceptional instructional leader.

Patty. Patty has been teaching for more than 30 years. She started her college studies as a biology major, but changed to a major in art. She got certified to teach kindergarten through ninth grade in another state, and taught at the elementary level for several years. When an opportunity arose to teach science at the middle school, she was eager to take it. Patty has worked for this district for eight years, five of those at her current school.

Patty's experience in leadership positions includes being the sixth grade lead teacher at her middle school in another state, and serving as off-site administrator for

field work. With this program, middle school students took week-long trips to state parks or beaches to learn science in the field. She received leadership training in her former school district. She has been science facilitator for the past three years.

Patty describes herself as "a very behind-the-scenes kind of leader." She believes leadership consists of looking out for difficulties before they occur, and then empowering people to make decisions in a very supportive way. She feels the leader has to look for people with a variety of skills, and then has to ask each person to take on a small role so that "nobody seems overwhelmed and it's more likely you'll get the job done."

During the first year of the Project, Patty reports that the science department was very solid. "And then the next year it just dissolved." Because of retirements and transfers, only two teachers of the original six were left. For two years, Patty and the other teacher at her grade level attempted to hold the program together with four long-term substitute teachers in the other positions. She says, "It was devastating, like an earthquake on a building, you just crumble, and with the two of us left, we were just holding up the walls." She looks forward to the coming

school year because all six positions will be filled by certified and experienced science teachers.

*What Factors Do Teachers Identify as Contributing to Their Success as Leaders?*

The factors identified here are closely inter-related; for purposes of clarity of presentation, they are discussed separately. The factors are: support for the teacher leader (from the principal, from the other science teachers on staff, from central staff, and from the district-wide group of science facilitators); professional development; and the process followed for developing a scope and sequence for science instruction.

*Support from the principal.* All eight participants spoke of the key role the principal plays in supporting teacher leaders. Six of the participants felt supported by their administrators most of the time. There were four main ways in which they described principal support. First, the principal who expresses interest and offers encouragement in a variety of ways has a very positive effect on the teacher leader. Of her principal, Karen said, "She likes science . . . she has a love for it in her heart and really thinks it's important for the students. She understands there's a

real role for science." Margie said she feels supported by her principal "100%. 100%. She doesn't make all the meetings, but pokes her head in or sends the curriculum specialist in if she can't. She gives positive comments, and sometimes negative, which is also support because it shows she's aware of what's going on."

JoAnne spoke about how her principal has gotten a much better understanding of the science curriculum: "She's really pushing our science teachers, those that aren't looking at the curriculum or using the curriculum, she's in there talking to them on a regular basis. She wants a good flow in her science department just like in her whole school." Referring to a former principal, Jim spoke of how he always felt his input was valued by that administrator. Carla remarked on how actively her principal had participated in Project institutes and meetings for principals.

In the school district, once instructional materials are initially purchased by the district with adoption funds, the principal has to take over the responsibility of replenishing consumable materials from the school budget; therefore, another important role for the principal is to provide the resources science teachers need. One participant said that no reasonable request for science items has been

refused. Another stated, "If there's money, she'll always let science have it." Of a former principal, one stated, "He was always able to find money for the stuff we needed." One science facilitator said about her principal, "She does the best she can. She tries to get us what we need. Next year she'll give us the science club fundraiser." Two facilitators reported that for the school year in question, there had been no money available at all for science.

For one school, the needed resource was classrooms: the principal helped reorganize the classrooms so that science teachers would not have to travel from room to room, and would be teaching in designated science classrooms with water and equipment.

The third way the principal can support the teacher leader is by meeting regularly with the facilitator. Two participants reported meeting with the principal on an on-going basis, either monthly or after each district facilitator meeting, while others met whenever the need arose. The regular meeting time seemed to be more productive, in some sense as an acknowledgement of the importance of the facilitator role.

Finally, one of the principals provided a framework for early-release Wednesdays which included one day per month for science teachers to meet as a group for two hours. This

was the only example given of a regularly scheduled meeting time during the work day specifically for science teachers; from this participant's comments, it seems to have been very valuable in continuing the work begun by the Project. There is more discussion of this topic in questions 2, 5, and 6.

*Support from other science teachers on staff.* In seven cases, the science facilitators reported feeling that, in general, the science teachers supported them very much in their efforts; the eighth participant felt supported by most, but not all of the science teachers. Examples of resistance by some science staff will be described in question 2.

The science teachers showed their support for the facilitator in many ways: coming to meetings, preparing for those meetings, being willing to take on a piece of a larger task and then seeing it through, participating in after-school events such as Family Science Nights, being open and honest with advice and criticism when necessary, and making suggestions.

The facilitators also felt they were listened to and respected. The nature of the interactions changed over time, according to JoAnne. "Two years ago they seldom came to me with requests. It got better this year. This year they let

me know what they were teaching, or what they wanted to do in their classrooms. Our new science teacher came to me regularly, even more so wanting to know how to present material as well as what materials do we have, but how do I teach this? How do I get this across?"

*Support from central staff.* Six of the participants commented on the help they received from collaborative teachers and the staff of the science resource department. They described the benefits of having a collaborative teacher organize the learning forums: "The collaborative teacher really pulled us together" and "The collaborative teacher helped us bond and gave us a focus, a way of looking at what we were doing." Commenting on visits made by central staff to her school, Marianne stated, "It was good to have all of you for support, it made us feel less disconnected to the rest of the district." Another benefit for the teacher leaders was that central staff laid the groundwork for the adoption of new curricular materials by reviewing the materials available, contacting publishers, and arranging for the pilot testing of materials.

In addition to organizing presentations and professional development sessions, the behaviors central staff exhibited during these were also cited as important

because they served as a model for how the facilitators could work with their own staffs. Effective behaviors and qualities they identified were the establishment of norms for the sessions, the ability to listen and include all participants' viewpoints in discussions and decision-making, and the patience exhibited by staff personnel.

*Support from other middle school science facilitators.*

From their experiences in cohort summer institutes and facilitator meetings with colleagues from across the district, six facilitators commented on the sense of camaraderie which grew among them, and how this contributed to their sense of having a leadership role. When asked how the culture of science teachers had changed, Patty responded, "At the end of the day, we're tired and we've come to a meeting, and we're sitting there exhausted, and then wait a minute, I'm sitting here with all the other people who want to do this, and it's kind of like this second wind comes over you, and you get very excited because you're sitting there with people like you, who are the engines of the change model, and yeah, it's really neat to feel that."

Linda also felt this charge: "I would sit there (at a meeting) and look at the whole team, and I would think

'These are the leaders of science, we all come together and we have the same ideas, the same goals...'. " Margie spoke of "a lot of interschool, in addition to intraschool communication, and that gives everybody a whole wider breadth of thought." Karen commented that the Project had "brought the middle school science teachers together as a community, rather than we're just little communities within ourselves."

*Professional development.* All eight participants made numerous references to the value of the professional development opportunities afforded by the SER Project. Their comments indicate that their experiences in institutes, workshops, study groups, and courses gave them a clearer understanding of inquiry-based science instruction and their own role as leader of the effort to establish this way of teaching, and it also helped build a team of teachers who could work together toward that goal.

They also spoke of real changes they saw occur in classrooms as a result of the work done by the Project. Changes in their own teaching and in others on their staff were a source of satisfaction for the teacher leaders, and are included in this section. Changes in relationships among science teachers will be addressed in question 5.

Karen believes the biggest change in her staff has occurred in her own teaching because she has participated in so many institutes and courses. She says, "I was never satisfied with just a canned type experiment. Now I try to change them a little bit so that there's some deeper thinking going on. Each year I try to change a little more toward inquiry." What Karen called a "canned type experiment" is referred to by several other teachers as "the cookbook"; this refers to the traditional model of science labs and experiments which consist of pre-determined questions, procedures, and conclusions which sometimes contradict what students actually observe. Once teachers become more comfortable with the philosophy and process of inquiry, that cookbook approach no longer dominates their teaching.

Jim described how the Project helped clarify the inquiry approach for him. "To some degree I was (using inquiry), but it really wasn't organized. I think the Project really sort of focused it and brought it all together." On the part of his staff, there has been a shift in emphasis so that "teachers are giving students problems and tools to solve problems rather than sort of the cookbook approach. We don't do that every time and every day but

there's many more people who are definitely working in that direction."

JoAnne believes inquiry is definitely taking hold with the science teachers. Speaking about one of her colleagues, she stated, "I look at Hannah now and she's a completely different teacher." She believes the students talk a great deal more about their science experiences, "they're not afraid of asking questions, they're allowed to ask questions and explore it. It's not all just teacher-directed learning."

Karen also reports that all science teachers now think more about questioning and consider if they are getting the idea of the lessons across to students. "I think the Project has made us more aware of the needs of our students and where exactly we want it to go. Before, we had not stopped to think about where we were going."

Patty echoes this same idea: "The Project has forced people to evaluate their own teaching and it's made them grow a bit, it's encouraged them to reform." Other changes noted by facilitators were less dependence on textbooks, increased use of laboratory equipment and technology, adaptations made through science to accommodate learners of English as a second language, and incorporating more writing

in the science class through the format of science notebooks.

There was no single experience from participation in Project-sponsored programs that participants identified as being of the greatest importance. Two facilitators commented that any opportunities offered during the summer were more beneficial because they felt more relaxed at that time, with no rushing about necessary. Carla and Linda felt they gained a good understanding of their leadership role from the first summer program, the Leadership Institute; the facilitator meetings were also identified as helping people get a grasp on their role. Margie and Marianne identified the Next Steps Institute as important because they were given more time to work with their team on issues specific to their site. Several facilitators commented on the value of the Inquiry Institute; Jim said, "You actually get in, do it, and it worked, you see things happening in your own understanding as you do the activity. It was very useful." Several also valued the learning forums very highly. JoAnne stated, "The excitement that came out of those - that was what made us a cohesive team."

The following statement from Marianne can serve as a generalization about the professional development opportunities:

I don't think it was any one thing. I think different people got what they needed from different aspects. And what was valuable to this teacher, I might not have found particularly useful, but I got what I needed in another area.

*Scope and sequence.* In all eight cases, the process of establishing a scope and sequence for science instruction at each school was addressed during their first year of participation in the Project; it was one of the first tasks to be confronted by the science facilitators as leaders and by the science staff as a team. For seven of the eight participants, the process gave them a sense of accomplishment, even when it was not fully and finally completed; thus it is included here as a factor contributing to the success of teacher leaders.

Some facilitators explained the reasons for having a planned scope and sequence. Patty stated, "We really needed to define what we wanted to teach in science. Everybody was doing good science but it was disjointed and there were serious gaps." At Marianne's school, "We had to have one (because of teacher turnover). It was just too haphazard." Linda's staff worked on it so that "eighth grade teachers now know what kids have done at sixth and seventh."

Facilitators followed various paths to arrive at a scope and sequence. Some worked on it with the collaborative

teacher during learning forums while others did it during after-school study groups or meetings. The process entailed looking at the state science standards, at what people currently taught and preferred teaching, and then making decisions about what topics should be taught at each grade level.

All facilitators commented on how difficult the process was. "It was a bear." "We were really floundering." "It was terrible." "Some teachers had to give up their favorite units that they liked to do." "People were hanging on to autonomy." "It was a pretty negative response initially. Everybody knew what they taught and how they taught and there was nothing wrong with it, and why does it all have to be uniform, why does it have to be the same, and then to the other extreme, well, then, why doesn't the district just give us something we can work with?"

Margie's comment about getting this task done summarizes the feelings of the facilitators as the scope and sequence took on some form: "When we got through with the scope and sequence, I really felt like, okay, I don't care if I do another thing, they could survive on their own now, as a group they're together." The scope and sequence seems to have been an initial step that had to be taken in order to be able to work on changing to an inquiry-based model of

teaching and in many cases helped people learn to work together more productively.

*What Factors Do Teachers Identify as Standing in the Way of Their Success as Leaders?*

Several factors which hindered teacher leaders' efforts were apparent in their responses: lack of support or conflict with the principal; resistance to change; time constraints; district policies; teacher and administrator turnover; the middle school model; and personal doubts about their own abilities.

*Lack of support/conflict with the principal.* In the discussion of question 1, principal support was identified as a factor contributing to the success of teacher leaders; similarly, some participants spoke of conflicts or lack of support from the principal as a hindrance to their tasks. Two described conflicts, and others spoke of how stronger help from the administrator would have made their jobs easier.

One participant contrasted a former administrator with the new one in place. The previous principal was described as a strong instructional leader, who modeled best practices, encouraged innovation, and provided teachers with recent research to support the innovations he tried to

implement. The school was organized into grade level teams which spent three weeks per quarter on an integrated thematic unit, with all subject areas involved in developing lessons organized around the same theme. The participant felt that all teachers' input was always valued and considered in decision-making. The new principal, on the other hand, was perceived to be breaking up teams, referred to as "cliques", was familiar with buzzwords of education but unable to serve as an instructional leader for professional development sessions on site, and was "completely uninterested" in teacher input.

Another facilitator felt the first person to serve as science facilitator for her school had been supported to a much greater extent than she was. During the first year in the Project, the principal told teachers to participate in after-school study groups; the participant did not receive that kind of support during her tenure in the position. She felt the principal had favorites on the staff; the favorites were listened to, while her input was not considered. When she went to him for approval of projects, the automatic response was "No, we can't do that." She also believed her principal was out of touch with recent innovations in education and did not understand inquiry teaching and learning, which made her task as facilitator more difficult.

Although supportive of her science staff in general, another principal lacked leadership skills which were resulting in a general decline in the quality of the school. This facilitator said, "We used to be a top middle school; now we're only average. We're frustrated because of a lack of leadership. There's friction because different people have different visions. The principal has to set the vision. When it's not done, we're not working as a big-knit group."

In a school with a number of long-term substitute teachers in science positions, the facilitator felt the principal could have done more to support them and ease the situation. The principal should have introduced the new people to students, "might have set the tone and set a standard" for expected behaviors and the treatment of these people. "Administration wasn't really there, didn't pop in once in a while to see how things were going. That could have made things easier."

*Resistance to change.* All participants talked about resistance to change in a general fashion, and some gave specific examples of resistance or a reluctance to try new ideas that they encountered while trying to implement the changes envisioned by the SER Project. "Some teachers have curriculum they've been using for 15 or 20 years and that's what they want to do; they don't want to do something

different." "Teachers tend to get entrenched and the longer you're doing it, the deeper the trench gets." Change "is like a dirty word - people look at you very suspiciously."

When attempting to bring about changes in science teaching, two facilitators remarked on the "pretenders", teachers who seem to go along with reform, but do not really carry it out in their classrooms. One said, "Sometimes I get a lot more lip service and show than what's actually going on." Another stated, "We had one who would talk the game and didn't want to play the game. It was very difficult for me to sit there and listen to this (teacher) espousing of the right way to do it, but then in reality to know that was not occurring in the classroom."

How did the facilitators deal with resistance? One suggested, "Instead of trying to force someone to change, it's more of a process and it needs to be facilitated. It's like, 'Let's try this, just try this one little thing' and it's kind of a progression." Another stated, "I don't think that just talking to them works. They need to see the benefits. They need to see modeling and showing the excitement in kids so it's worth the time and effort to make those changes." Another suggestion was that the influence of the principal can be used in some fashion: "The administrator can help out a lot if they make it known that it's required."

*Time.* All eight facilitators identified lack of time as a definite problem in trying to make meaningful change.

"Time is the magic word." "Time is the issue, time is always the issue." "The facilitator role is time-consuming; that's why the first facilitator gave it up." "Time is our biggest constraint." "Lack of time is a hindrance." "That's probably my greatest frustration, not having time to meet with people."

Karen spoke about time in relation to lack of teacher participation. She believes that rather than resistance to change, in some cases, non-attendance at after-school professional development activities or in summer institutes may be due more to a desire for personal time with young children; that time is "more highly valued" by teachers with young families.

Facilitators made time for the extra work required by their roles by using their planning periods and lunch breaks, contacting or meeting with teachers before or after school, doing their planning and grading of papers at home in the evening, and relying more on email for brief communications with the teachers, the principal, and central staff.

*District policies.* Time for the professional development of teachers was the purpose of the early-out

Wednesdays instituted by the district during the school year in which this study was conducted. In some cases, the schools had already been doing early-out Wednesdays and had established programs which had to be changed. In other cases, the early-out Wednesday was new to the schools, and principals had to quickly put together a program. Guidelines for what this program would look like were interpreted very differently by different principals.

JoAnne's school had had early-out Wednesdays for many years: the first Wednesday of each month was for individual planning in the classroom; the second was for work with the grade level team; the third was for the subject area team; and the fourth was for whole faculty professional development. Her principal's understanding of the new district plan was that the previous system had to be eliminated; she believed all Wednesdays had to be for total faculty professional development.

The administration of Marianne's school, however, used the same model JoAnne's school had used for years: one Wednesday for individuals, one for teams, the third for subject areas to meet, and then the last Wednesday of the month for a total school session. Carla's principal also used a similar model for his school: one Wednesday for teams, one for subject areas, and two for study groups. Another variation was found at Linda's school: teachers met

on Wednesdays by subject area, but did not work on their subject area; they met that way only to form smaller groups which worked on tasks assigned by the principal, mostly revolving around testing of students.

There was a great deal of confusion about the nature of the early release day. One facilitator stated, "The district didn't give clear enough guidelines as to what they wanted." Facilitators viewed the early-out Wednesdays as a complicating factor. Some of them viewed the new policy as being imposed on them from above. For those whose previous Wednesday programs were superceded, there was resentment. In some cases, science teachers were unable to meet as they had in previous years. In only one school of the eight was any of this time regularly put to use for science teachers to meet and work together as a group.

*Turnover.* Only two of the eight facilitators reported that turnover was not a problem for their science departments. Teacher turnover and changes in administration had negative impacts on the facilitators' attempts to improve science instruction. The extreme case was Patty's; all her efforts for two years were focused on shoring up the four long-term substitutes; she and the other science teacher at her grade level spent all their time trying to

maintain some semblance of a science program across all three grade levels.

Marianne also reported many changes in science personnel. There was at least one new person at every grade level every year she has been there; some left mid-year and long-term subs were brought in.

There are many effects from this turnover. Carla stated, "The new people don't have the training, the camaraderie (from the SER Project). There was a wealth of information, so they don't have the consistency, the cohesiveness." In Karen's school, two of their six positions have changed several times. "It's really difficult to learn to work closely as a team. It's all in the feeling and working towards the good of the student, and that doesn't always come across when you're having so many changes."

Changes in administration also are challenging. Marianne's school has had almost yearly changes in its administrative positions. When asked questions about the principal during her interviews, her first response was always, "Which one?" Linda also felt that her principal's retirement mid-year, and the appointment of two interim principals for the remainder of the school year had a negative effect on her ability to "get anything accomplished" for the science staff.

*The middle school model: grade level team or subject area department?* In some instances, there seems to be a certain tension between the philosophy of the middle school model and the focus of the SER Project on the specific content area. Jim expressed this: "Every school is called a middle school but there's not many that really are. It's a junior high, it's set up just like a high school for younger kids." He explains that ideally, sixth grade should be closer to the elementary model, with fewer teachers for each student, then seventh grade, as a transition year, adds more teachers and elective subjects, and in eighth grade, there is less teaming, and instruction is done more by individual subjects, as in high school.

Karen reports that when she first started working in her school, "Everything was team, you didn't even say the nasty word 'department.'" The focus has changed, however, and she attributes this to the effect of increased testing, and the subsequent need for math and language arts teachers to meet as a group.

All the participants stated that the grade level team was the primary group teachers identify with; the subject area team was listed as second by all participants. Although this was not identified as a problem by facilitators, when meeting time is limited anyway, the focus on the grade level team will have an effect on how much time can be spent on

meeting with the content area, unless a structure is provided which balances the competing needs. This was done by Linda's principal in his plan for the early-release professional development Wednesdays.

*Personal doubts.* Four of the facilitators spoke about the self-doubts they experienced as they took on this leadership role. Two of them expressed a lack of confidence because they did not have a strong background in science. One of them stated, "The more content I get, the safer I feel, the more I feel that I have the right to talk to anyone about what they need to do." The increased self-confidence grew over time and with additional studies in science coursework.

Another participant said of her self-esteem issues, "It's hard for me when I see expertise in others, it's kind of a blockage." This may be a natural reaction of teachers to leadership: one facilitator believes that "teachers maybe traditionally are not ones for shaking up the basket. It's a little frightening stepping out there. I felt like I was going to be a lightning rod for a while. Teachers have this attitude of 'Leave me alone and just let me do my job'."

*Is There Evidence of the Empowerment of the Teacher Leaders?  
If So, How Do They Express That Empowerment?*

As described in Chapter 2, teacher empowerment refers to shared leadership and opportunities for autonomy, responsibility, choice, and authority (Lightfoot, 1986). The empowered teacher sees beyond her/himself to the setting, and participates actively in the life of the community (Prawat, 1991; Rappaport, 1987). To determine if and how the teacher leaders in this study had become empowered, several factors were considered: participants' understanding of leadership; examples they gave of how they lead; the circumstances in which they reported feeling like leaders; personal and professional goals; and other leadership roles they held.

*Participants' understanding of leadership.* All eight participants used the words "dictate" and "dictator" in several instances throughout the interviews to convey their sense of what leadership is not. It is not something imposed on others. They spoke of leadership with phrases such as "helping others," "facilitating for others," "empowering others," "steering people in the right direction," and "setting the stage for others to be successful." They acknowledged the need to include others in decision-making, and pointed out the importance of building a consensus by

sharing leadership tasks with others. "Leadership is not just one person trying to do everything, it's a whole community of people." Three of them mentioned a likeness to the parenting role.

*How they lead.* The science facilitators described two main ways by which they try to effect change. The first was leading by example, or in some cases, it could be termed leading covertly. The second was by sharing leadership tasks so that other teachers also took on leadership roles; they felt this sharing of tasks increased people's buy-in for change.

An important component of sharing leadership tasks was acknowledging the work done, thanking people for their efforts, and making explicit that people had acted as leaders in these circumstances.

Karen provided one example of leading teachers toward more use of an inquiry-based approach to science teaching. She and a colleague "sort of do it through the back door. We'll go to others with a canned experiment and ask, "How can we change this?" so that they see that this is what we're trying to instill in our classes, and we hope that they'll stop and think, "Should we be changing, too?"" Carla referred to the same technique with the phrase "show by example." She constantly stresses to teachers that there is

activity going on in her classroom, that the active part of learning is important; she encourages them to come in and observe her students at work.

Jim described two ways of leading: "You can state your position overtly and get people to agree with you. Or you can just do things. You raise expectations." This is another example of leading covertly. He talked about how he had started using the natural environment around his school as a living lab for his students; over the years, this practice spread to other teachers because of the success Jim had, and because the students responded so positively. "I didn't tell the other science teachers that they should do it - they did it because they wanted to, they found it was effective."

A final example of this kind of leadership was given by Patty, who described how she initiated the process of developing a scope and sequence for her school. "I did a survey of what we were all teaching. I didn't say anything, just posted the results. They were surprised - they said, "What a hole! We teach no earth science!" I let them decide that."

All eight participants spoke of sharing leadership tasks with others and encouraging others to become leaders. Linda stated, "All teachers should be leaders!" Margie encourages this by getting the other science teachers to lead a science meeting or a part of the meeting. She

reported telling them, "I'm the science facilitator, but I don't have to lead every meeting - you all can, you are all very valuable people." While working with her grade level team, Carla described the rotation of leadership they use: "We meet daily. We have a weekly agenda ready ahead of time, and everybody takes a turn acting as leader each day." At some point, the team becomes self-directed, and the leader steps back. Carla stated, "I haven't reached that point yet as science facilitator - that takes a while, with all the new people coming in."

JoAnne stated, "It takes someone to haul others in and give them little bits and pieces of things to do. Then we need to say to them, "You were a leader" because I don't think they see themselves in that way. Little by little some of these people step up in small increments to take on more." JoAnne found new teachers very willing to take on these pieces. Patty spoke about the importance of public acknowledgement of teachers' efforts. That shows "someone trusts you and values your expertise." Carla also mentioned how recognition and thanking people encourages leadership.

*The circumstances in which they felt like leaders.* The participants were asked to describe an occasion on which they really felt like a leader of science education reform. In general, this occurred when they moved beyond

disseminating information and organizing meetings, and into more of an instructional leadership role.

Two facilitators reported feeling like real leaders when their school's scope and sequence took form and consensus was reached on its format. Two others spoke of leading inservices for their teachers; the focus of the inservices was inquiry, and they felt very successful in modeling that approach to their staffs. Another facilitator organized a collaborative lesson study in which the science teachers jointly planned a lesson, and then were released from their classrooms to go observe the lesson being taught by a colleague. It was very successful. "It was like my little baby, I did it from the beginning, I got everybody excited about it, and I feel like my presentation to the teachers made it possible."

Two participants responded that rather than one specific event, their feelings of being a leader of reform developed over time and crystallized within the past year. One reported that now everyone on campus - teachers, students, and parents, too - connects her to science. When there is a science question, they come to her. The other also reported really feeling like a leader during the past school year because science teachers, and other staff members, supported her role in a school restructuring effort

and looked to her for leadership in every phase of that effort.

One participant spoke of feeling like a leader of science education reform previously in another state, but in her current position, the lack of a stable science staff stymied her efforts. She had had to contain a difficult situation rather than lead.

*Personal and professional goals.* For the eight participants, their goals for science teaching and learning at their schools center on their students to a much greater extent than on teachers and programs. There has to be a benefit for children in all this effort they make. Better thinking skills and problem solving ability in children were frequently mentioned as a goal. An appreciation in students of lifelong learning was another. Students enjoying science and making connections from the classroom to their own lives were also mentioned by several participants as an overriding goal.

Teacher leaders' goals for their own futures included: plans to participate in the National Board Certification program; taking more science content coursework; a master's degree; a doctoral degree and work with pre-service teachers at the university level; and administrative certification. Two who will retire within five years envision continuing to

work, but on a more limited basis. One would like to see the district initiate a program in which teachers could work half-time, paired up with new people for several weeks or by quarter. Referring to the experienced teachers who will be retiring, one said, "You just can't let this wealth go sailing into the sunset and never hear from them again."

One participant spoke about being taken further as a leader. "I don't know what that is, but it's like we need to go to the next level. You start hearing the same things over and over and over and to grow professionally we need new, we need to be pushed."

Finally, one has reached the point where she realizes she can lead her leader, the principal, in some areas. Speaking about plans for professional development sessions for the next school year, she said, "You sort of go the way your boss leads you when you start something. Now I've got to lead my boss a little bit now that I've sort of figured out what's going on."

*Other leadership roles they hold.* Three facilitators served on their school site councils during the year of this study. All served on committees at the school level. Four conducted presentations or study groups at the school or district level, or presented at off-campus professional organizations and conventions during the same year. One was

active in the teachers' professional organization and had leadership roles there. One was a leader of a school restructuring effort.

To summarize, the teacher leaders in the study provided examples which indicate they have been empowered as leaders. They take responsibility for improving the quality of the science programs at their schools, they share leadership with others, and they clearly see beyond their individual classroom to the total school perspective, and even to a district-wide perspective. Although they are not in positions of formal administrative authority in their schools, they perceive an effect of their efforts that have resulted in change in others' performance.

*What Effect Does School Culture Have on Efforts to Change Science Teaching and Learning?*

While it is beyond the scope of this study to make an assessment of the cultures of the specific schools, the importance of the school culture on change efforts can be shown by comparing two of the schools as described by the participants who work there. There are clear differences of culture between Mountain Vista Middle School and Valley View Middle School which have a great impact on their personnel and programs. The factors of school culture as delineated by

Gruenert & Valentine (1998) serve as a framework for this discussion.

*Collaborative leadership.* At Mountain Vista Middle School, the book *Turning Points 2000* is guiding the school's efforts to provide a high quality program for its students. When the new principal introduced the book to the faculty two years ago, she asked them first to envision what the best possible middle school could look like. If there were no boundaries, and money were not a concern, what would the faculty want the school to be? From that initial gathering of ideas and preferences, two areas of focus were decided upon, so that during the past school year, the faculty concentrated on developing an effective advisor/advisee program, and block scheduling for sixth graders.

The science facilitator reported that input from teachers is the critical piece in developing these plans. During Wednesday professional development sessions, the principal brings the staff a topic to address. The staff breaks into smaller discussion groups, and then all go back to a large group discussion with the ideas they have generated. The faculty recommendation is then taken to the site council. At other times, the topic itself is generated by the staff and taken to the site council for discussion. There is a give and take among the principal, the site

council, and the total staff. People feel their opinion counts and that their participation is important.

As an instructional leader, the principal is "such a fantastic teacher." She leads the faculty through meetings in which she models various instructional strategies; for the last five minutes of the meeting, she explains the strategy to them and provides a handout for their notebook of instructional practices to try out with their students.

At Valley View Middle School, "By and large, teachers' input has not been valued" by administrators. The constant turnover of administrators and teachers has had serious consequences. The site council during the past school year "fell apart" when the parent members resigned from the council. "When the parents quit, the whole committee stopped meeting." The facilitator also felt that instructional leadership by the several administrations has been minimal. Another big concern was lack of communication from the administration, "a big issue for the past six or seven years at least."

*Teacher collaboration.* The facilitator at Mountain Vista reports that a high degree of collaborative work goes on at her school. Grade level teams meet regularly, develop integrated units, and share them with the faculty. Many conversations among teachers are about teaching practices

and classroom management. In general, teacher talk is positive, except for one of the three lunch periods.

For the principal of this school, collaboration is "an expectation." At staff meetings, she uses seating charts to mix people up so that different grade levels and subject area teachers get to know each other. "Nobody likes it, but it's forced us to talk to each other, people you'd probably never sit and talk with." The facilitator stated, "There's really nobody (at our school) that goes into their room and closes the door and that's it. I can't think of a single person."

The facilitator at Valley View reported that although the staff in general is supportive of each other, collaborative work among teachers "is minimal. It is lacking."

*Professional development.* The facilitator reported that many faculty members at Mountain Vista take courses and are in degree programs. The school secretary, the clerk, several teaching assistants, and a curriculum support person are all in the process of becoming teachers. The facilitator believes that is a testament to the high regard people at the school feel for the profession.

For the Wednesday professional development afternoons, the principal often uses "on-site expertise," her own

teachers, to guide the sessions. Thus the science facilitator presented three times during the school year, familiarizing the whole staff with inquiry-based instruction and how it can be used across the curriculum, not only in science.

When asked about how teachers at Valley View value professional development, the facilitator responded, "It's been neglected, it's not something we hear. I personally don't hear from colleagues that this is what we need because there's been so many other issues at the school that professional development has taken second place, or third, or somewhere down the list."

During the study groups scheduled twice per month for the Wednesday afternoons, "because there were so many other problems in the school, they would be discussing the problems and not what the focus (of the study group) was:"

*Collegial support.* The Mountain Vista facilitator reported that in her opinion, the faculty has been stable because "people are satisfied with what's going on with the school." She believes there is trust and support among the teachers. "I don't know anybody at the building that I couldn't go to and ask for information and they wouldn't just load me with things."

The Valley View facilitator also reported that most people at her school trust and respect each other. The high turnover among teachers, however, may indicate that the degree of collegial support is not strong enough to overcome the hurdles that exist for people new to the school, and so they leave. During the past year, "everybody was so stressed out that it was a very unhealthy environment."

*Unity of purpose.* The mission of Mountain Vista is to prepare students to be well-rounded and strong intellectually and emotionally; to not just feel good about themselves, but to have an academic preparation strong enough to make them productive citizens. The mission of the school is what guides the collaboration and the professional development that occur. The facilitator referred again to *Turning Points 2000* as the tool that was used to develop the mission statement.

At Valley View, the school mission was recently rewritten by the restructuring committee. It is to provide a safe, productive school environment where all students have the right and opportunity to learn. It is very similar to the previous mission statement which was "gone over at the beginning of the year. I think most probably everybody forgot it." The restructuring committee at Valley View is

also using *Turning Points 2000* to guide them as they develop their plans for renewing their school.

*Learning partnership.* Communication and cooperation among teachers, parents, and students has recently increased at Mountain Vista due to a requirement by the principal that all grade level teams conduct parent/teachers conferences with at least 75% of the parents during mid-October. The facilitator reported that last year, her team was able to meet with between 85% and 90% of the parents. There were many benefits. "It really set the tone for the rest of the year. We really have the support of the parents because they have that face, that there are caring teachers here, too."

After those conferences, contact is maintained through phone calls and emails. During one challenging unit the science facilitator taught, she needed help in the classroom and mentioned it to her students; the next day there was a minimum of seven parent helpers for her in every class period. She also identified a Saturday family science day which a colleague had done for several years as an important factor in developing closer relationships with parents. She believes most field trips are science-related, and those opportunities to chaperone also bring parents into the school. Still, she feels the relationship between the school and the parents is one that has to be improved upon more.

The Valley View facilitator stated that parents at her school generally like the science program and send in supplies to support the activities. The contact between school and home is done through parent/teacher conferences; overall, there is quite a bit of communication, but "It's something that we still need to work on. It has been inconsistent among the different teams of teachers."

To summarize the differences between the two school cultures, about Mountain Vista the participant said, "There's an excitement of sharing of ideas, even at those high burnout times of year--it's a good school." The contrast with Valley View is great: "If the school isn't operating in a manner that's safe and educationally sound and if it doesn't have a good environment, then somebody needs to do something. It's really been very hard on us." The culture that exists at a school affects every facet of the experiences of students and adults.

In spite of what appears to be a problematic school culture, the science facilitator and science teachers at Valley View were successful at creating a scope and sequence and in achieving a greater degree of collaboration than had existed previously; however, teacher attrition continued to be a problem. Again, several science teachers left the school after the last school year; new members will have to

be familiarized with the goals of the SER Project and brought into the group of science teachers.

To summarize the responses to the set of questions about school culture from all participants, five stated that teacher input is valued by their administration and that teachers are included in decision-making, while three responded that this is not the case. Five believe that teachers work collaboratively and constructively to advance the school's vision and three said that while there is some collaboration, this is not true across the board in their school. Seven participants responded that most, not all, teachers value professional development and personal growth while one felt that was not true because other more basic needs took precedence.

All eight participants believed that teachers trust and support each other at their schools. Six participants believe that teachers work toward a common mission and are united in their purpose, while two responded that no common mission exists. While there were differences in their descriptions of parental involvement in the schools, all eight participants believe that more communication and cooperation among parents, teachers, and students is needed.

*How Are Collaborative Structures and Relationships  
Established at a School?*

All eight participants stated that participation in the SER Project had increased the collaboration and communication among science teachers at their schools and that relationships among the science teachers had deepened. As evidence of this, five of the eight spoke of differences between the science teachers and other subject area groups in their schools.

Karen commented, "We're more organized and we know what we want more. The fact that there is someone who speaks for the department helps, whereas the others don't have that, they don't necessarily get together and talk as a department as much as we do." Margie described how her principal has often used the science teachers as an example to other groups at their school: "The principal has pulled me into math meetings to say how science is collaborating." Patty echoed this: her principal has often referred to the science department when she encourages the other departments to work together and develop a scope and sequence for instruction.

Marianne reported that the science teachers are the only group that ever meets together and that science is the only content area with a scope and sequence for instruction. "We feel like we're a team--it's the science teachers--and none of the other disciplines have that. We're feeling a

whole lot more connected with each other, like we're all on the same track."

JoAnne stated that the science department is definitely the strongest department in her school. The nature of the interactions among science teachers is different from that of other groups.

In other departments, especially language arts and math, there are a lot of philosophical differences, one dominant personality trying to convince everybody else that their way is right, and they never get to the nuts and bolts, the things that are really going to make a change.

While there had been differences in philosophy among the science teachers (a high school orientation versus an elementary one, different pedagogical approaches) when the Project began, those differences were lessened as a result of their shared experiences and learning. "It seems like when we sit down and talk now, we don't have to deal with any of them (philosophical differences), we're able to focus on whatever the problem is."

*Collaborative structures.* Participants' comments indicate that a structural framework for collaboration is needed first so that relationships can develop from them. The SER Project summer institutes were the initial impetus; they provided an understanding of the nature of the desired reform in science teaching, gave teachers opportunities to experience inquiry-based science as learners themselves, and

encouraged the development of concrete goals for the individual schools to work on through the action plans that were required. Some of the goals of the various schools included the scope and sequence, the development of a common format and expectations for the use of science notebooks, study groups to look closely at student work, Family Science Night programs, and evaluation tools of student learning. These goals were what focused the science teachers' subsequent efforts.

During the school year between the two summer institutes, the learning forums provided the framework for the individual science teams to interact. "A huge amount of time was spent talking about us as a science department. The time to actually sit and talk was a huge value to us." The forums "brought it home to our own school, we put ourselves under a microscope, so to speak."

Several participants pointed out the importance of having this time during the work day so that all teachers were able to attend. "If it wasn't during the duty day, it wasn't going to happen." The forums "let us get out of the classroom for a while, just enough to empower the people." The forums "weren't an add-on to our day. We could go back to our afternoon classes and do what we had just learned. It was very pertinent."

After the second summer institute, continued collaboration depended on the initiative of the science facilitator and the science teachers. All eight reported that the science teachers continued to meet as a group, in varying degrees. In four schools, the meetings were held before school on an as-needed basis.

In Carla's school, the principal scheduled department meetings one day per month, held during the Wednesday afternoon professional development sessions, and science teachers had a one- to two-hour block of time to meet. The facilitator attributed the completion of her school's scope and sequence, after two years of trying to get it done, to this block of time, and to her principal's concern in having it in place for the new teachers coming in.

Another successful model was that of Margie's school: all the science teachers shared a common planning period, and they met as a group once per week.

In two schools, the Wednesday district initiative decreased the time available for science teachers to meet; these science facilitators reported that they met before school or for a brief time at the end of the Wednesday afternoon sessions.

*Collaborative relationships.* Given the conceptual framework provided by the SER Project and the time scheduled

for joint work during the school day, the relationships among science teachers changed. Comments from participants attested to this: "We know each other as people now. Some of the walls have come down and that makes people much more relaxed in our group. We've become more human towards each other." "I think we were used to being our own bosses to a great extent. We were used to having a lot of autonomy in our classroom. We've gone from everybody just kind of being on their own, to where we're really working together."

According to JoAnne, the changes in relationships occurred because during learning forums, they were able to bond. "Every time we met, the collaborative teacher had us do sharing and we found out something new about each other. There was always time at the beginning and at the end for that personal part. We now meet together and we talk about curriculum, we talk about instruction. We're all on the same page."

Five of the participants spoke about another factor which may facilitate or hinder collaborative relationships among teachers: the physical set-up of teachers' classrooms, where the classrooms are located in relation to the other science classrooms. In one school, all six science classrooms are arranged in a pod. They are all interconnected with office and storage space on the inside. The facilitator said, "We're just so fortunate that people

can run and ask each other questions any time. Everything's together." She reported that new teachers are especially helped in this way.

In JoAnne's school, the science teachers at each grade level are in rooms adjacent to each other, with an office and storage area they share. She stated that this helped promote common work.

Margie referred to the fact that "the physical locations separate people" in her school. The school is organized into pods per grade level; teachers seldom go to the common faculty lounge because they have pod rooms with telephones and refrigerators. Her school is a warm teaching community, but "a new person would have to tap into it" because of these physical separations.

Patty's school campus has "four different structures, it's a very spread-out campus, lots of little nooks and crannies for people to be in." She mostly stays in her pod of four classrooms. "My feeling is we're a little stand-offish--we stay in our room unless we know you."

Marianne also emphasized how important the physical plant is as she described the difficulty for science teachers who did not have designated science classrooms and had to travel from room to room. In the case of her school, she sees the designation of specified science classrooms as

one of the accomplishments of the collaboration that has grown among the science teachers.

When asked about the effect of the placement of classrooms, Carla responded, "If you make the effort, you can get together. Sure, it would be nice to have a nice little science area, that would be ideal because then you're interacting all the time. But the facilities are what they are in different buildings, so it requires a different effort."

*How Do Collaborative Structures and Relationships Become Sustained Over Time?*

When asked about how the gains made by participation in the SER Project could be sustained over time, the science facilitators responded that efforts at the school level and at the central level have to be made.

*School level.* At the school level, the mentoring of new teachers was identified by five participants as critical to sustaining inquiry-based science instruction. Karen was one of those who believed it would be easier to work with new people: "They're not quite so set in their ways, so change comes about a little easier." Linda suggested that new teachers be encouraged to observe other teachers at work in the classroom as part of the mentoring process.

Patty suggested the development of mentoring programs linking new teachers with retiring teachers who are interested in continuing to work part-time. She envisions working one-half or one-third of the day, staying with new teachers for one quarter or more of the school year. "We lose people because we don't help them in the beginning. We don't maintain that help, either. There needs to be a support system."

Carla spoke of differences between her generation of teachers and the new one coming in. "My generation that's getting ready to retire, you were just this isolated (person), and 'this is my room and you can't come in, the only one allowed in here to observe me is the principal.'" She sees current teachers in training as being more open to observation and joint work because of the practices of videotaping and critiquing their work that go on in the colleges of education. She believes they are more used to teamwork, "which is a good sign." Carla believes the mentoring of new teachers will be one of the facilitator's most important roles, and that a mentor can really work well with only one mentee at a time.

The other factor for sustainability at the school level is the continued role of the science facilitator. Jim suggested that facilitators be trained more extensively in how to do presentations for inquiry-based learning so that

new members learn about this if their teacher preparation coursework did not include it.

Two participants suggested that facilitators be given an extra planning period or some type of job share arrangement so that they could work more with other science teachers in the classrooms. Patty explained this view when she spoke about the facilitator's responsibility for sustaining change and the principal's burden of responsibility: "The principal already has a lot on the plate and any time you want to do change, it's not like something gets pulled off the plate - you get a second plate with all of these change things on top of it." She feels the facilitator can assume some of that responsibility for sustaining the change effort, but that the facilitator needs either the extra planning period or some release time to keep up with the demands.

Two of the participants suggested that facilitators should receive stipends for their role as was done during the first years of the SER Project.

*Central level.* Six of the participants spoke about the need for continued support for science instruction from the central staff after the SER Project funding ceases. Four mentioned the need for facilitators to continue meeting as a district-wide group to keep in touch with others and learn

what is happening at other sites. Patty stated, "Those are key to find out what other people are doing. It's like the Critical Friends group, the more people you have in the group, the easier it is to solve a problem."

Jim's suggestion that facilitators be trained to do more inservices in inquiry requires some support from central staff. Jim also suggested that central staff continue presenting the yearly inquiry institute so that continuing teachers "get a shot in the arm" and new teachers "are brought on line." He suggests that learning inquiry approaches and science content are both very important and can be done very well through the institute; he also believes teachers should receive college credit for their participation, in addition to stipends and instructional materials that are provided.

JoAnne made the following observations about the state of mathematics professional development in the district: "I just watch what's happened to the math department (at her school). None of that (professional development through workshops and training) is going on, so you have new teachers coming in and the training is not there like it used to be." She feared this would be the case with science if support for science instruction from central staff were withdrawn.

*Chapter Summary*

This chapter presented a summary of teacher leaders' opinions and reflections about their experiences as they worked to establish collaborative structures and relationships among science teachers at their schools. The six research questions addressed: the factors that support teacher leaders; the factors which hinder their effort; the empowerment of teacher leaders; the effect of the school culture on teacher leaders; the ways in which collaborative structures and relationships are established; and the ways in which those structures and relationships can be sustained over time.

## CHAPTER 5

## SUMMARY AND DISCUSSION

This chapter is a summary of the work done in a study of teacher leaders attempting to bring about change in the context of a federally-funded grant program. The sections of the chapter are:

- Introduction
- Statement of the Problem
- Review of the Methodology
- Summary of the Results
- Analysis/Discussion of the Results

*Statement of the Problem*

The purpose of this study was to explore teacher leaders' experiences as they attempted to establish collaborative structures and relationships which would result in improved science instruction at their schools. Teacher leaders in the study were middle school science facilitators, full-time classroom science teachers. These teachers took on the additional role of acting as liaisons between the science teachers at their school and a local systemic change project, the Science Education Reform Project, referred to as the SER Project, funded by the National Science Foundation.

### *Review of the Methodology*

As explained in Chapter 2, this study employed a qualitative perspective to explore and understand participants' experiences in a school change effort and the meanings they attached to those experiences. By uncovering patterns and themes in teacher leaders' descriptions of their work with other teachers, the researcher's goal was to identify the critical variables which affect the success or failure of efforts to build collaboration among school staff members. Eight teacher leaders, in addition to two who served as pilot interviewees, participated in this study.

A case study approach was used; the experiences of the individual teacher leaders were gathered through interviews and then "layered or nested within an overall primary case approach" (Patton, 1990, p. 298). The researcher used a three-part interview design developed by Seidman (1991). In the first part, the participant's past life history was examined to establish a context of understanding; the second part examined the participant's current experiences in detail; in the last part, the participant reflected on what he/she has learned or discovered.

### *Summary of the Results*

This section is organized according to the findings for each research question.

*Factors which contribute to teacher leaders' success.*

Support for the teacher leader from several sources was expressed as important to their success as leaders. The most frequently mentioned sources of support were:

- The principal, who expresses interest and encouragement, provides material support for the science program in terms of supplies or designated science classrooms, meets with the facilitator to discuss the needs of the science program, and, in one case, provides specific meeting times during the work day for all science teachers to meet.
- Other science teachers support the teacher leader by attending meetings, preparing for the meetings, actively participating by taking on parts of larger tasks, offering advice and criticism, and showing respect for the teacher leader.
- Central staff from the SER Project and the district science resource department support the teacher leader by organizing institutes and other learning experiences and by modeling behaviors which help the teacher leader learn how to work with others.
- The district-wide group of science facilitators is a source of support because of the camaraderie and sense of belonging to a leadership group which has

developed; they learn from each other about successes and failures.

Professional development was identified as an important factor because it provided teacher leaders with a better understanding of the goal of their efforts--inquiry-based instruction and learning--and gave them a better understanding of their role as leaders. The professional development experiences also promoted collaboration among the science teachers who attended them. Teacher leaders saw changes in instruction which validated their work. No single experience from the array of professional development opportunities offered by the SER Project was identified as most beneficial; rather, it seems that different individuals took what they needed from different experiences.

The process of developing a scope and sequence of science instruction at each school was identified as helping teacher leaders succeed because it laid the groundwork for future work on inquiry learning and also because the process served as an example to the group of how to work collaboratively.

*Factors which stand in the way of teacher leaders' success.* Lack of support from the principal or conflict with the principal can hinder teacher leaders' efforts. Two participants described conflict or lack of support which had

an effect on their plans for improving science instruction. Two others spoke about a need for stronger principal leadership which would have made their jobs easier.

Resistance/reluctance to change was a hindrance to teacher leaders' work. While the teacher leaders did not meet with outright refusals to change, there was some degree of resistance to the changes in practice that the SER Project was promoting. In some instances, teachers pretended to go along with reform ideas while not actually putting them into practice in their classrooms.

Time constraints were a limitation for all the participants. Unless a meeting time was built into the workday, it was difficult to gather all science teachers together for a long enough period of time to get the teacher leaders' goals accomplished. During the first year of participation in the Project, learning forums provided time for interacting; after that, teacher leaders met with teachers before or after school or during lunch, and did some of their own work at home rather than at school.

Another complicating factor was a new policy instituted by the district during the year of this study; it created some confusion for teacher leaders. The intent of the policy, to create a two-hour block of time every Wednesday for the professional development of all teachers, in almost all cases did not create time for science teachers to meet.

In some cases, science teachers were able to meet less than in other years'. The guidelines for the use of these Wednesdays were interpreted differently by principals; in only one school was any of the Wednesday time given to department meetings. In the school where this was the case, the teacher leader reported favorable results. In another school, all science teachers had a common planning period, allowing them to meet once per week; this also had positive consequences.

Teacher and administrator turnover was a big concern for the participants. Teacher attrition in two of the schools had grave consequences, and even in schools with less turnover, teacher leaders saw the difference between people who had participated in SER Project events and those new to the district. Administrative changes also made it more difficult for the teacher leaders to work consistently toward their goals.

There was some tension between the grade-level team emphasis of most middle schools and the subject area emphasized by the SER Project. This was not specifically identified as a problem by participants, but with meeting times limited, in schools where the team concept predominated, less time was available for subject area teachers to meet.

Some participants expressed doubts about their own abilities to lead. In two cases, the lack of a science background was cited. Participants believed that with experience, training, and additional coursework, they gained more confidence.

*The empowerment of teacher leaders.* In all cases, teacher leaders contrasted "dictating" and "being a dictator" with what they understood to be the correct way to lead: building consensus and support over time and including others in leadership tasks and decision-making. They stated that the leader is one who helps others, setting the stage for others to become successful. The leader is a facilitator of others' learning and empowerment.

Their style of leadership was expressed in two ways: they led by example, covertly; by asking others for advice in changing toward more inquiry-based instruction and thus hoping to provoke others into making similar changes in practice. The other way they led was by inviting other teachers to participate in leadership tasks. They believed leadership should be shared; an important part of this was that teachers' efforts must be acknowledged and made public.

When asked about their successes as leaders, most participants gave examples in which they had been instructional leaders, organizing and presenting inservices

to staff, making headway with their schools' scope and sequence of instruction, and representing the field of science for others on their campus.

In all cases, when asked about personal and professional goals for the future, these goals included further study and learning, continued leadership roles, and continued participation in school communities, even for those who will retire within a few years. A very important factor in the goals they expressed was that there had to be an effect on students for them to consider their efforts successful. Their work had to have an impact on children's problem solving abilities, and they hoped children would apply what they learned in science to their everyday lives.

All participants had other leadership positions in their schools in addition to being the science facilitator. The participants seem to have become empowered; they believe their efforts as leaders have brought about some real changes in practice, they see well beyond their individual classrooms to the total school and the district-wide community, and they see a continuing role for themselves in science education reform.

*The effects of school culture on teacher leaders.*  
Gruenert and Valentine's (1998) six factors of school culture were used to frame the protocol questions on the

culture that existed at the eight schools the participants represent. Those factors are: collaborative leadership, teacher collaboration, professional development, collegial support, unity of purpose, and learning partnership. It is beyond the scope of this study to assess the culture of each school represented in the study, but the contrast between two of the schools described highlights the pervasive effect of school culture on every aspect of school life.

In one school, the teacher leader responded positively to questions about the strength of each of the six factors; there were indicators of success in all six. In another case, almost all the factors were weak or non-existent because the total school was under such stress. Although some gains were made in the second school in spite of the problematic school culture, continued attrition of teachers posed a challenge for the science staff and for the sustainability of the goals of the SER Project. Teacher turnover may be both a cause and a consequence of a negative school culture.

The groups of science teachers at the eight schools portrayed in this study seem to have made gains in strengthening their subgroup of the school culture. In some schools, teachers and administrators seemed to recognize that the group was more unified than others. The teacher leaders also recognized the value of belonging to a larger

group of science facilitators from across the district. This group formed another level of science teacher culture.

*Establishing collaborative structures and relationships at a school.* Evidence that collaboration among science teachers has increased at all of the eight schools was provided by the teacher leaders. In five cases, the science department was recognized by principals and other teachers as being more defined and more of a unit than the other curricular areas. Some principals encouraged other departments to work on a scope and sequence of instruction as had been done by the science staff.

The structures which helped promote this collaboration were the summer institutes of the SER Project, study groups in some schools, and the learning forums which occurred during the school year between the two summer institutes. The importance of doing the learning forums during the work day was emphasized. This allowed all science teachers to participate; the participation of all teachers was considered a critical piece which could not have happened either during the summer or before or after school.

After the first two years of participation in the grant, the structure for continued interactions at the school site was generally meetings before school or at the end of the early-out Wednesday afternoons. In one school,

one Wednesday per month was dedicated to department meetings, and in another school, science teachers met once a week during their common planning period.

Relationships among science teachers seemed to change as a result of being able to work together over a period of time that allowed them to get to know each other better. Through the summer institutes and learning forums, they interacted much more than they had been able to previously and developed a greater understanding of each other's backgrounds, interests, and aspirations. All participants reported positive changes in relationships. They trusted each other more. Once those personal relationships were strengthened, then they were able to take the goals of the SER Project and develop plans to implement changes in practice in their classrooms.

Another factor mentioned by some participants was the benefit of having science classrooms in the same general area; the physical set-up of the science classrooms in some cases facilitated increased communication among teachers. When this was not the case, communication occurred, and just required more effort. In one school, having designated science classrooms was a gain the staff made as a result of working together.

*Sustaining changes made in collaborative structures and relationships.* Sustaining the gains made by the science teachers who participated in the SER Project was recognized as a challenge by all the teacher leaders who were interviewed. Their comments and suggestions were geared to factors at the school level and also at the district level.

At the school level, teacher leaders emphasized the importance of mentoring new teachers coming into the system. Although there is some indication that new teachers are being trained to collaborate more than was previously the case, science facilitators recognized the importance of maintaining that common vocabulary and understanding among all science staff.

Also at the school level, teacher leaders saw an ongoing need for a science facilitator to continue the work begun. Some facilitators believed the role would be expanded with the end of the SER Project.

At the district level, teacher leaders believe some level of support from central science staff will always be needed to organize workshops, courses, and other professional development opportunities. They want to continue meeting and collaborating with the science facilitators from across the district. One participant suggested that central staff continue to organize the yearly

Inquiry Institute; this would benefit both new and experienced teachers.

### *Analysis/Discussion of the Results*

This study reported the experiences of eight teacher leaders. Whatever findings or insights that emerge from it are context-specific and thus not widely generalizable. Nonetheless, some findings do relate to the literature described in Chapter 2. The findings are organized here into three areas: leadership, of the principal and of teacher leaders; the effects of a school change effort, referring specifically to changes in teaching practice and changes in relationships among teachers achieved through collaboration; and the sustainability of the changes brought about by the reform effort. Following the discussion of those areas are recommendations for educators, and suggestions for further research.

*Interpretation of the findings and relationship of the study to previous research.* Although the focus of this study was teacher leaders, not principals, one clear finding is the centrality of the principal's role in the school. Participants provided multiple snapshots of effective and ineffective leadership from administrators and their profound effects on all aspects of school life. In the

section on school cultures presented in Chapter 4, the great contrast between the administrations in two of the schools highlights how critical the principal is in establishing a safe, healthy, and productive environment in which teachers and students can work and learn.

The effect of principal leadership on teacher leaders as reported here supports Lambert's (1998) position that the role of the principal becomes even more important if teacher leadership is to be successful. The principal initiates teacher leadership by fomenting collegial relationships among staff, supports leaders by providing the time and resources they need, and focuses the vision of the school on both student and adult learning. The importance of principal initiation, support, and visioning were all mentioned by participants in this study.

The study yielded descriptions of teachers who have become leaders of science education reform. The biographies of the eight participants reveal many commonalities. They are experienced teachers: seven of the eight had more than 10 years' teaching experience, and although one had only five years in the classroom, she had previously worked in schools at different jobs for several additional years. Three participants had taught for over 20 years, and two had taught for over 30 years. They are career educators, committed to the profession for the long-term.

Another characteristic common to all was a love of learning combined with a love for children and the subject they teach. No one of them had an undergraduate degree in science, although some of them had done extensive coursework in science; two had begun their studies in a science field and then switched to education. One had a science minor, one had two degrees in a social science, and another had a master's degree in science. All eight expressed a keen interest in science and an appreciation of its potential for engaging learners and helping children see the connections between school and their daily lives. They all continued to do coursework and attend workshops to increase their understanding of science. All the participants frequently commented on the uniqueness of middle school children, and while acknowledging the difficulties of the age group, they expressed an enthusiasm for working with middle schoolers and a commitment to staying at the middle school level.

The effectiveness ratings assigned to the science facilitators by central staff in Table 3 may reflect the impact of negative school cultures on the ability of teacher leaders to act. Conflict with an administrator, perceived lack of support, or frequent changes in administration have an effect on what teacher leaders are able to accomplish.

The participants are part of the third wave of teacher leadership, as described by Silva, Gimbert, and Nolan

(2000), meaning that they lead but stay in the classroom. They have developed a clear understanding of what leadership entails and have learned strategies to use in place of formal administrative authority. Their practice of shared leadership and consensus building is supported by Katzenmeyer's and Moller's (1997) position that change does not come about by mandate, but on a person to person basis; commitment to change is created by giving people leadership roles. The teacher leaders in this study understood this and made many references to sharing leadership tasks and promoting the growth of leadership in their colleagues.

While all of the teacher leaders had previous leadership training and experience, their participation in the SER Project seems to have moved them through a developmental process which, as described by Lambert (1998), took them from a focus on the classroom to a more systemic perspective, not only to the whole school level, but also to an interest and concern for science instruction across the district. According to Lightfoot (1986), Rappaport (1987), and Prawat (1991), they have become empowered. They feel the most empowered when they are in an instructional leadership role, presenting inservices and guiding study groups and courses; in these activities, they go well beyond the role of disseminating information. They are instructional leaders.

The conflict described by LeBlanc and Shelton (1997) between teachers' needs for achievement and for affiliation were not expressed by the participants in this study. Katzenmeyer and Moller (1996) also discuss how breaking out of the egalitarian mold and changing roles is risky for teachers. This was voiced by some participants, but not to a large extent. Only one participant mentioned jealousy or resentment felt toward the teacher leader. For most of them, it was not present. This may be because they actively engaged others in leadership tasks; and since many, if not all, teachers from each school's science staff participated in the SER Project activities, that also may have contributed to a shared sense of engagement in the Project goals with no resentment for those leading the process.

The only caveat participants placed on their leadership activities was that they serve to enhance the quality of the education being offered to students. In other words, all the professional development and leadership work they do must have an effect on children's learning; they had to perceive a benefit for the students. This was evident in the interviews of all the teacher leaders. Silva, Gimbert and Nolan (2000) emphasize that teacher leaders show a strong ethical commitment to children. Little (1990) found the same attitude in her review of the research on teacher collegiality, as did Sawyer (2001).

Silva, Gimbert, and Nolan (2000) also discuss how important it is for teacher leaders to build relationships, modeling professional growth and helping colleagues to change. They suggest that teacher leaders approach their tasks as co-learners; this seems to be the approach taken by the science facilitators in the SER Project.

Rinehart and Short (1994) found that additional coursework and mentoring of teacher leaders results in their empowerment. This is attested to by the participants in the study as they spoke about the multiple professional development opportunities they have availed themselves of, and as they spoke of future plans to continue learning.

The second cluster of findings concerns the effects of the reform effort, the Science Education Reform Project. One effect identified by study participants was a change in teaching practices; another was change in relationships among teachers. Although they do not believe that all science teachers use an inquiry approach all the time, they have seen positive changes in classroom behaviors in themselves and in many teachers on their staffs. Learning is less teacher-directed; student questions and ideas are sought more. Teachers on most staffs have agreed on what to teach at what grade level.

The changes were brought about by the experiences provided by the Project through the summer institutes,

learning forums, study groups, and other opportunities for professional development. These experiences created a common understanding of the Project's goal--inquiry-based science instruction. This conceptual framework seems to have been a critical piece, a rallying point to which science facilitators and most science teachers were willing to commit. Perhaps because they were given the opportunity to experience inquiry learning first-hand, they were able to understand its value for students. At the same time, the working together toward this common goal helped forge collaboration, thus paving the way for changes in relationships.

In most cases, the nature of the collaboration among science teachers seems to have gone beyond what Fullan and Hargreaves (1996) classify as "comfortable collaboration" (a sharing of hints and advice, while continuing to act alone in the classroom) to a collaboration that more closely approaches what Fullan and Hargreaves deem to be true collaboration. This entails the sharing of a common vision and taking responsibility for improved services to children. The work done to develop a scope and sequence for science instruction is illustrative. In some cases, teachers had to give up some of their favorite units to teach; they did so because they saw it would be for the good of the students.

The frequent references to the success of the science teachers in developing the scope and sequence and the fact that science teachers seem to speak as one compared to other curricular areas in the schools lends added credence to the success of the Project in bringing about more collaborative relationships among science teachers.

Establishing collaborative relationships requires a re-examination of underlying assumptions, as described by Schein (1992). The unspoken, taken-for-granted bedrock cultural beliefs which have predominated American classrooms center on privacy of practice, "boundedness", as named by Lortie (1975). The science teachers described in the study seem to have made some progress in breaking down the privacy norm and becoming more willing to engage in an examination of their classroom practice, thus making an initial step toward authentic collaboration.

In her description of the social organization of schools, Rosenholtz (1991) uses the following factors to identify the extent to which the workplace is collaborative or not: increased teacher certainty about the technical culture of teaching (how to teach); shared teaching goals; some involvement of teachers in decision-making; and team teaching. From the descriptions given by study participants, these characteristics seem to be present within the context

of the science staff at several of the various schools represented in this study.

According to Bryk, Camburn, and Louis (1999), a professional community exists in a school when the following practices are evident: reflective dialogue about teaching practice and student learning; deprivatized practice; peer collaboration; a focus on student learning; a sense of collective responsibility; and the socialization of new members. To varying degrees, the science facilitators' stories contained all of these factors. Science teachers at the eight schools seem to have made a start toward building professional, collaborative communities.

Whether the gains made by the science teachers can be sustained over time is the question addressed by the third cluster of findings from this study. In Chapter 2, Table 1 shows a list of factors which support the sustainability of change efforts, as found by Fullan and Steigelbauer (1991), DuFour and Eaker (1998), Florian (2000), Cuban (2001), Hargreaves et al. (2001), Century and Levy (2002), and St. John (2002). Those factors exist at the individual level, the school level, and the district level. Almost all of these factors were mentioned at some point in the interviews by the study participants.

At the individual level, teacher leaders expressed their personal commitment to following through with the

gains made by the SER Project (Florian, 2000). They have the needed skills and knowledge and recognize the importance of continued professional development to reinforce those (Hargreaves et al., 2001; Keedy et al., 2000).

At the school level, participants saw a clear need for the mentoring of new members as they enter the system. This is supported by Fullan and Steigelbauer (1991) and Cuban (2001). Even if teacher preparation programs are now teaching inquiry-based science approaches, there is still a need to bring new members into the group and help them with the daily realities of the classroom. Study participants also identified a continuing role for science facilitators; mentoring would be part of that role.

Time for collaboration during the school day is another critical piece for sustainability at the school level (DuFour & Eaker, 1998; Florian, 2000). The participants recognized how the time spent together during the work day was the only way that all science teachers could interact and thus get to the point where real changes in practice could be achieved.

At the central district level, study participants saw a need for ongoing support from central staff to coordinate further professional development and communication among the teacher leaders district-wide. This is supported by St. John's (2002) position that teachers and principals need the

help of curriculum specialists and coaches to continue the work begun with the support of the large funding agencies such as the National Science Foundation. An important part of this work would be to ensure that new members become familiar with the reforms as they enter the system; the responsibility for the training of new members takes place at both the school and the district levels.

Finally, the sustainability of the reforms envisioned by the SER Project requires that teachers be provided with the materials and supplies necessary for effective science instruction; Century and Levy (2002) found that, specific to science education reform, is the need for the refurbishment of the needed materials. Study participants made frequent mention of the principal's role in obtaining money or supplies for the science program, and the difficulties when funds for these were not available.

*Recommendations for educators.* This study confirms the value of professional development for instituting and sustaining changes in the schools. A key to engaging teachers in a reform effort may be that the desired reform is respected, intellectually challenging, and perceived as in the best interest of students. The goal of the SER Project, inquiry-based science instruction, was one which many teachers embraced even though it often required

profound changes in their thinking and classroom practice. This can be contrasted with the less than enthusiastic response of teachers to the type of reform which calls for increased testing of students and labeling of schools as failing or underperforming.

From the experiences related by the teacher leaders in this study, it is evident that the early-release days for professional development of teachers offer a golden opportunity for increased collaboration and culture building. Teacher leaders attested to the value of the time they had spent together during activities sponsored by the SER Project: personal relationships were strengthened to the point where there was enough trust among members that they were able to make real changes in what and how they teach. The structure creates space and time in which the desired collaborative relationships can flourish.

Merely carving out the time does not ensure that effective collaboration will be the result, however; teachers need a goal and focus, which in the case of the Project was inquiry-based instruction, they need to understand the goal, and they need techniques and procedures to follow so that gains are actually achieved. The SER Project provided teachers with a variety of experiences that proved valuable. A few examples of these are: in-depth inquiry investigations of phenomena so that teachers would

understand as learners themselves how to structure the experiences for students; effective instructional models for the classroom; techniques for looking at the questions teachers ask of students and ways to classify the questions which arise from students; and a protocol for looking at work samples from students in order to improve teaching practice and student products. The early-release professional development days then can be a vehicle for high quality experiences for teachers, when planned carefully.

Teacher leaders' understanding of leadership as a shared endeavor which empowers others to take a more active role in their work lives is a viewpoint which principals should embrace and put into practice. Barth's (1990) vision of the principal as coalition-builder is pertinent here. Teachers can be encouraged to take leadership roles for the causes that are most important to them. Teacher leaders such as the science facilitators can be the instructional leaders for subject areas, grade level teams, or special cross-grade or cross-curricular areas of concern. Again, just creating the position is insufficient; the teacher leaders need training in leadership skills and ongoing professional development themselves so they can be more effective as practitioners and as leaders. The principal has to provide the support and resources the teacher leaders need to become successful.

There is some indication that the school culture can be re-shaped by sub-groups such as occurred with the science teachers in some of the schools. Their success in defining the scope and sequence of science instruction and in working together collaboratively was recognized at several schools by principals and other staff members; they were used as an example for others to follow. The processes they followed can be used by other curricular areas or grade level teams, thus strengthening the overall school program.

There may also be value in creating district-wide groups of teacher leaders who learn together and from each other, thus forming another level of common culture. The experience of being part of that group was cited as helpful by several of the participants.

#### *Suggestions for Additional Research*

Funding agencies are concerned with knowing if their large investments have consequences beyond the funding period; therefore, studies similar to this one, conducted at other sites which have participated in local systemic change grants through the National Science Foundation, would be useful. Further studies of the role of teacher leaders in large-scale change efforts would be of interest.

This study was limited to middle school science facilitators working with the SER Project. It would be

valuable to obtain the perspectives of principals and science teachers who also participated; the combined information from three different viewpoints would be instructive.

Given the frequent references to the development of the scope and sequence for science instruction at the various schools, the question arises as to what is actually being taught in classrooms and whether a commonly agreed upon curriculum, consistently used by teachers, facilitates desired changes in practice, and as a corollary, if more can be accomplished in professional development programs for teachers when a coherent program of study is in place. The experience of the teacher leaders in this study seems to indicate that, in addition to a clearly articulated and desired goal, such as inquiry learning, a common context provided by a core curriculum is needed. It forms a shared experience base on which the examination of teaching practice and student learning can be initiated.

Another variation on this study would be to look at the changes in science instruction that occurred at the elementary schools. The context is quite different and might yield valuable insights into improving science teaching and learning.

In keeping with the views of the teacher leaders who participated in this study, the goal of future studies

should always be to examine teaching practices from the viewpoint of the effects on what students have learned and can do. Thus, further studies of teacher leadership and collaboration will require gaining an understanding of the impact of teacher leaders' efforts on their teaching and on the learning which occurs in both students and teachers.

## APPENDIX A

## CHARACTERISTICS OF EFFECTIVE SCIENCE FACILITATORS

Please rate each middle school science facilitator on the following thirteen descriptors of effective science facilitators by marking:

3 to indicate "yes"

2 to indicate "to some extent"

1 to indicate "no"

"dk" Don't know, to indicate that you do not have enough information to rank the person on that characteristic

Facilitator \_\_\_\_\_

## 1. Personal Characteristics

- a) has a clear vision of the goals of the Project and the National Science Education Standards \_\_\_\_
- b) sees beyond the classroom \_\_\_\_
- c) is a life-long learner \_\_\_\_
- d) is excited about science \_\_\_\_
- e) is social, outgoing, respectful and supportive of others, is respected, works well with all \_\_\_\_
- f) high level of professionalism \_\_\_\_

## 2. Professional Knowledge

- a) understands the nature of science \_\_\_\_
- b) knows and uses best practices in the classroom, as described by the National Science Education Standards \_\_\_\_

## 3. Actions as a Science Facilitator

- a) attends sessions for science facilitators \_\_\_\_
- b) gathers and shares information by communicating with the Project staff, teachers, and the principal on a regular basis \_\_\_\_
- c) initiates study groups, professional development sessions for teachers or whole staff, mentors new teachers, teaches courses or does presentations for peers (any one of these) \_\_\_\_
- d) models leadership for others \_\_\_\_
- e) has established collaborative structures and relationships among science teachers at the site

## APPENDIX B

## INTERVIEW PROTOCOL

## Part I: Focused Life History

1. Tell me about how you became a teacher.  
Probes: Where and what was studied? Science background? Master's degree? Why science? How many years teaching experience, how many at present school?  
Any experience at other levels? Why middle school?
2. Describe any leadership roles you have had in the past.  
Probes: Any training in leadership skills? How many years as science facilitator? How did you become the science facilitator? How do you define leadership?
3. Talk about your past experiences in the Project.  
Probes: What institutes did you, your principal, the other science teachers attend? Describe what was done in the summer institutes. Describe what was done in the learning forums. Describe any study groups, science courses, or workshops you have facilitated.
4. Describe the turnover of science teachers and/or administrators at your school since the Project began.  
Probe: What effect has this had, if any?
5. How would you describe the goal of the Project to someone unfamiliar with it?

Part II: Details of the Experience

1. If you were describing to someone what it is like to work at your school, in any subject area, what would be the main points of your description?

Probes: Collaborative leadership: to what extent does the school leader value teachers' input? How does the school leader include teachers in decision-making?

Teacher collaboration: To what extent do teachers plan together, observe each other's classrooms, work together to improve practice?

Professional development: To what extent do teachers value personal growth, look for new ways to improve practice, keep up with educational issues?

Collegial support: To what extent do teachers trust and help each other?

Unity of purpose: Describe your school's mission and how people work to achieve it.

Learning partnership: How much communication and cooperation is there among teachers, parents, and students? What is the goal of this communication and cooperation?

2. Tell me about what you do as science facilitator.

Probes: How do you make time for this role? Are you compensated?

3. Talk about your goals for science teaching and learning at your school.

4. Describe a time when you really felt like a leader of science education reform.

5. How do you define collaboration?

Probes: Give an example of a time the science teachers at your school collaborated well. Give an example of a lack of collaboration. How is collaboration among science teachers different from that of other groups at your school?

6. How does the school as a whole collaborate?

Probes: Give specific examples. What is the role of the administrator in this?

7. How are the early-release professional development days being used by the staff? By the science teachers? By you?

Probe: To what extent is this professional development time valued by staff?

8. In what ways is your administrator an instructional leader?

9. How does your administrator support your work as a science facilitator?

Probes: How is science instruction supported? How are all the science teachers supported?

10. How do the science teachers support you, or not support you, as science facilitator?

### Part III: Reflection

1. Give examples of how science instruction has changed as a result of the work done by the Project.
2. Which experiences were more useful in bringing about changes in science teaching: the summer institutes, the learning forums, workshops, courses, conventions, facilitator professional development sessions, meetings with the principal?

3. You have participated in a school change effort for several years now. Why or why not should we change what we do in our schools?

Probe: What have you learned about change?

4. How has your understanding of leadership changed, if it has?

Probes: How can teachers take on leadership roles? What are the problems involved? What has helped you become a better science facilitator? What things have made it harder for you to be a better science facilitator?

5. How has collaboration among science teachers brought about any changes?

6. How has the culture among science teachers changed?

7. Once the funding for the Project ends, how will its goals continue to be enacted?

8. What will your role as science facilitator look like in the future?

9. What goals do you have for your future in the profession?

10. What more can you tell me about what we have talked about in these interviews?

11. What should I have asked you that I did not?

APPENDIX C  
HUMAN SUBJECTS APPROVAL

Human Subjects Protection Program  
[http://vpr2.admin.arizona.edu/human\\_subjects](http://vpr2.admin.arizona.edu/human_subjects)

30 May 2002

Thea Cañizo, M.Ed.  
Educational Leadership  
8875 E. McCellan St.  
Tucson, AZ 85710



1350 N. Vine Avenue  
P.O. Box 245137  
Tucson, AZ 85724-5137  
(520) 626-6721

RE: **BSC B02.115 ESTABLISHING COLLABORATIVE STRUCTURES AND  
RELATIONSHIPS: TEACHER LEADERS' EXPERIENCES**

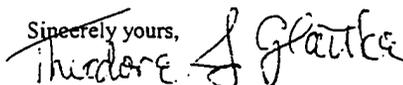
Dear Ms. Cañizo:

We received your research proposal as cited above. The procedures to be followed in this study pose no more than minimal risk to participating subjects. Regulations issued by the U.S. Department of Health and Human Services [45 CFR Part 46.110(b)] authorize approval of this type project through the expedited review procedures, with the condition(s) that subjects' anonymity be maintained. Although full Committee review is not required, a brief summary of the project procedures is submitted to the Committee for their endorsement and/or comment, if any, after administrative approval is granted. This project is approved effective **30 May 2002** for a period of one year.

The Human Subjects Committee (Institutional Review Board) of the University of Arizona has a current assurance of compliance, number M-1233, which is on file with the Department of Health and Human Services and covers this activity.

Approval is granted with the understanding that no further changes or additions will be made either to the procedures followed or to the consent form(s) used (copies of which we have on file) without the knowledge and approval of the Human Subjects Committee and your College or Departmental Review Committee. Any research related physical or psychological harm to any subject must also be reported to each committee.

A university policy requires that all signed subject consent forms be kept in a permanent file in an area designated for that purpose by the Department Head or comparable authority. This will assure their accessibility in the event that university officials require the information and the principal investigator is unavailable for some reason.

Sincerely yours,  


Theodore J. Glattke, Ph.D.  
Chair  
Social and Behavioral Sciences Human Subjects Committee

TJG:tl

cc: Departmental/College Review Committee

APPENDIX D  
SCHOOL DISTRICT APPROVAL



**Department of Accountability and Research**

---

442 East Seventh Street - Tucson, Arizona 85705  
(520) 225-5418 - Fax (520) 225-6532  
<http://paweb.tusd.k12.az.us>

May 16, 2002

Thea Canizo  
Middle School Science  
Tucson Unified School District

**Project Title: Establishing Collaborative Structures and Relationships:  
Teacher Leaders' Experiences**

Dear Ms. Canizo,

I am pleased to inform you that your request to conduct research in the Tucson Unified School District has been approved for the 2001- 2002 school year. Please forward a copy of your dissertation to me when completed.

If you have any questions please call me.

Sincerely,

A handwritten signature in black ink, appearing to read "Al Gould", is written over a horizontal line.

Albert W. Gould, Ph.D.  
Research Project Manager

## REFERENCES

- Barth, R. S. (1990). *Improving schools from within: Teachers, parents, and principals can make the difference*. San Francisco: Jossey-Bass.
- Bolman, L. G., & Deal, T. E. (1997). *Reframing organizations: Artistry, choice, and leadership*. San Francisco: Jossey-Bass.
- Bryk, A., Camburn, E., & Louis, K. S. (1999). Professional community in Chicago elementary schools: Facilitating factors and organizational consequences. *Educational Administration Quarterly*, 35(Supplemental), 751-781.
- Bulach, C., & Malone, B. (1994). The relationship of school climate to the implementation of school reform. *ERS Spectrum*, 12(4) 3-8.
- Bush, G. (1991). *America 2000: An educational strategy*. Washington, DC: U.S. Department of Education.
- Bybee, R. W. (1997). *Achieving scientific literacy: From purposes to practices*. Portsmouth, NH: Heinemann.
- Carnegie Forum on Education and the Economy. (1986). *A nation prepared: Teachers for the 21st century*. New York: Carnegie Corporation.
- Century, J. R., & Levy, A. J. (2002, April). *Sustaining change: A study of nine school districts with enduring programs*. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.
- Coleman, J., Campbell, E., Hobson, C., McPartland, J., Mood, A., Weinfield, F., & York, R. (1966). *Equality of educational opportunity*. Washington, DC: U.S. Department of Health, Education, and Welfare, U.S. Government Printing Office.
- Cuban, L. (1990a). A fundamental puzzle of school reform. In A. Lieberman (Ed.), *Schools as collaborative cultures: Creating the future now* (pp. 71-77). New York: Falmer Press.

- Cuban, L. (1990b). Reforming again, again, and again. *Educational Researcher*, 19, 3-13.
- Cuban, L. (2001, May). *Answering tough questions about sustainability*. Paper presented for the online Conference on Sustainability. Cambridge, MA: TERC.
- Darling-Hammond, L. (1997). *The right to learn: A blueprint for creating schools that work*. San Francisco: Jossey-Bass.
- DuFour, R., & Eaker, T. (1998). *Professional learning communities at work: Best practices for enhancing student achievement*. Bloomington, IN: National Educational Service.
- Florian, J. (2000). *Sustaining education reform: Influential factors*. Aurora, CO: Mid-continent Research for Education and Learning.
- Fullan, M. G., & Hargreaves, A. (1996). *What's worth fighting for in your school?* New York: Teachers College Press.
- Fullan, M. G., & Stiegelbauer, S. (1991). *The new meaning of educational change*. New York: Teachers College Press.
- Getzels, J. W., & Guba, E. G. (1957). Social behavior and the administrative process. *The School Review*, 65, 423-441.
- Glanz, J. (1998) *Action research: An educational leader's guide to school improvement*. Norwood, MA: Christopher-Gordon.
- Glatthorn, A. A. (1998). *Writing the winning dissertation: A step-by-step guide*. Thousand Oaks, CA: Corwin Press, Inc.
- Gruenert, S. (2000). Shaping a new school culture. *Contemporary Education*, 71(2), 14-18.
- Gruenert, S., & Valentine, J. W. (1998). *The school culture survey*. Columbia, MO: University of Missouri.

- Guba, E. G. (1978). *Toward a methodology of naturalistic inquiry in educational evaluation*. Los Angeles: UCLA Center for the Study of Evaluation.
- Hargreaves, A., Earl, L., Moore, S., & Manning, S. (2001). *Learning to change: Teaching beyond standards and subjects*. San Francisco: Jossey-Bass.
- Harris, B., & Drake, S. M. (1997). Implementing high school reform through school-wide action research teams: A three year case study. *Action in Teacher Education*, 19(3), 15-31.
- Heckman, P. E. (1993). School restructuring in practice: Reckoning with the culture of school. *International Journal of Educational Reform*, 2(3), 263-272.
- Hoy, W. K., & Miskel, C. G. (1982). *Educational administration: Theory, research, and practice* (2nd ed.). New York: Random House.
- Hoy, W. K., & Miskel, C. G. (1996). *Educational administration: Theory, research, and practice* (5th ed.). New York: McGraw-Hill.
- Hoy, W. K., & Sabo, D. J. (1998). *Quality middle schools: Open and healthy*. Thousand Oaks, CA: Corwin Press.
- Hubbard, R. S., & Power, B. M. (1993). *The art of classroom inquiry: A handbook for teacher-researchers*. Portsmouth, NH: Heinemann.
- Jackson, A. W., Davis, G. A., Abeel, M., & Bordanaro, A. (2000). *Turning points 2000: Educating adolescents in the 21<sup>st</sup> century*. New York: Teachers College Press.
- Katzenmeyer, M., & Moller, G. (1996). *Awakening the sleeping giant: Leadership development for teachers*. Thousand Oaks, CA: Corwin Press.
- Keedy, J. L., Winter, P. A., Gordon, S. P, & Newton, R. M. (2000, April). *School councils, collegial groups, and professional development as teacher empowerment strategies: Assessing the evidence for instructional capacity building*. Paper presented at the Annual

Meeting of the American Educational Research Association, New Orleans, LA.

- Knapp, M. S. (1997). Between systemic reforms and the mathematics and science classroom: The dynamics of innovation, implementation, and professional learning. *Review of Educational Research*, 67(2), 227-266.
- Lambert, L. (1998). *Building leadership capacity in schools*. Alexandria, VA: Association for Supervision and Curriculum Development.
- LeBlanc, P. R., & Shelton, M. M. (1997). Teacher leadership: The needs of teachers. *Action in Teacher Education*, 19(3), 32-48.
- LeCompte, M. D., & Preissle, J. (1993). *Ethnography and qualitative design in educational research*. San Diego, CA: Academic Press.
- Leithwood, K., Aitken, R., & Jantzi, D. (2001). *Making schools smarter: A system for monitoring school and district progress*. Thousand Oaks, CA: Corwin Press.
- Leithwood, K., Dart, B., Jantzi, D., & Steinbach, R. (1994). *The development of schools as learning organizations*. Victoria, BC: Final report submitted to the BC Ministry of Education.
- Leithwood, K., & Jantzi, D. (1999). The relative effects of principal and teacher sources of leadership on student engagement with school. *Educational Administration Quarterly*, 35(Supplemental), 679-706.
- Leithwood, K., Leonard, L., & Sharratt, L. (1998). Conditions fostering organizational learning in schools. *Educational Administration Quarterly*, 34(2), 243-273.
- Lightfoot, S. L. (1986). On goodness in schools: Themes of empowerment. *Peabody Journal of Education*, 63(3), 9-28.
- Little, J. W. (1990). Teachers as colleagues. In A. Lieberman (Ed.), *Schools as collaborative cultures: Creating the future now* (pp. 165-193). New York: Falmer Press.

- Lortie, D. C. (1975). *School-teacher: A sociological study*. Chicago: The University of Chicago Press.
- Louis, K. S., & Marks, H. M. (1998). Does professional community affect the classroom? Teachers' work and student experiences in restructuring schools. *American Journal of Education*, 107(4), 532-575.
- Louis, K. S., Marks, H. M., & Kruse, S. (1996). Teachers' professional community in restructuring schools. *American Educational Research Journal*, 33(4), 757-798.
- Loup, K. S., & Blase, J. (1999). Political forces in education: Bright prospects in the shift to systemic reform. *NASSP Bulletin*, 83, 39-47.
- Maehr, M. L., & Midgley, C. (1996). *Transforming school cultures*. Boulder, CO: Westview Press.
- Marks, H. M., & Louis, K. S. (1999). Teacher empowerment and the capacity for organizational learning. *Educational Administration Quarterly*, 35(Supplemental), 707-750.
- National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform*. Washington, DC: U.S. Government Printing Office.
- National Governors' Association. (1986). *Time for results: The governors' 1991 report on education*. Washington, DC: Author.
- National Research Council. (1996). *National Science Education Standards*. Washington, DC: National Academy Press.
- National Science Foundation. (1996). *The learning curve: What we are discovering about U.S. science and mathematics education*. Arlington, VA: Author.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods*. Newbury Park: Sage Publications.
- Patton, M. Q. (2002). *Qualitative evaluation and research methods*. Newbury Park: Sage Publications.

- Peterson, K. D., & Deal, T. E. (1998). How leaders influence the culture of schools. *Educational Leadership*, 56(1), 28-31.
- Peterson, K. D., & Deal, T. E. (1999). *Shaping school culture: The heart of leadership*. San Francisco: Jossey-Bass.
- Prawat, R. S. (1991). Conversations with self and settings: A framework for thinking about teacher empowerment. *American Educational Research Journal*, 28(4), 737-757.
- Raizen, S. A. (1992). The reform of science education in the U.S.A.: Deja vu or de novo? *Studies in Science Education*, 19, 1-41.
- Rappaport, J. (1987). Terms of empowerment/exemplars of prevention: Toward a theory for community psychology. *American Journal of Community Psychology*, 15(2), 121-145.
- Reichers, A. E., & Schneider, B. (1990). Climate and culture: An evolution of constructs. In B. Schneider (Ed.), *Organizational climate and culture* (pp. 5-39). San Francisco: Jossey-Bass.
- Reitzug, U. C. (1994). A case study of empowering principal behavior. *American Educational Research Journal*, 31(2), 283-307.
- Rinehart, J. S., & Short, P. M. (1994). Job satisfaction and empowerment among teacher leaders, reading recovery teachers and regular classroom teachers. *Education*, 114(4), 570-581.
- Rosenholtz, S. J. (1991). *Teachers' workplace: The social organization of schools*. New York: Teachers College Press.
- Rutherford, F. J., & Ahlgren, A. (1990). *Science for all Americans*. New York: Oxford University Press.
- Sarason, S. B. (1982). *The culture of the school and the problem of change*. Boston: Allyn and Bacon.

- Sawyer, R. D. (2001). Teachers who grow as collaborative leaders: The rocky road of support. *Education Policy Analysis Archives*, 9(38), 1-17.
- Schein, E. H. (1992). *Organizational culture and leadership* (2nd ed.). San Francisco: Jossey-Bass.
- Schlechty, P. C. (1997). *Inventing better schools: An action plan for educational reform*. San Francisco: Jossey-Bass.
- Seidman, I. E. (1991). *Interviewing as qualitative research*. New York: Teachers College Press.
- Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday.
- Senge, P., Kleiner, A., Roberts, C., Ross, R., Roth, G., & Smith, B. (1999). *The dance of change: The challenges of sustaining momentum in learning organizations*. New York: Doubleday.
- Short, P. M. (1994). Defining teacher empowerment. *Education*, 114(4), 488-492.
- Short, P. M., & Greer, J. T. (1997). *Leadership in empowered schools*. Upper Saddle River, NJ: Prentice-Hall.
- Short, P. M., & Rinehart, J. S. (1992). *School participant empowerment scale*. Lexington, KY: Authors.
- Short, P. M., & Rinehart, J. S. (1993). Teacher empowerment and school climate. *Education*, 113(4), 592-598.
- Silva, D. Y., Gimbert, B., & Nolan, J. (2000). Sliding the doors: Locking and unlocking possibilities for teacher leadership. *Teachers College Record*, 102(4), 779-801.
- Smircich, L., & Morgan, G. (1982). Leadership: The management of meaning. *Journal of Applied Behavioral Science*, 18(3), 257-273.
- Smith, M., & O'Day, J. (1991). Systemic school reform. In S. Fuhrman & B. Malen (Eds.), *The politics of curriculum and testing*. Bristol, PA: Falmer Press.

- Smylie, M. A. (1995). New perspectives on teacher leadership. *The Elementary School Journal*, 96(1), 3-7.
- St. John, M. (2002). *The improvement infrastructure: The missing link or why we are always worried about "sustainability."* Paper prepared for the online Conference on Sustainability. Cambridge, MA: TERC.
- Stone, M., Horejs, J., & Lomas, A. (1997). Commonalities and differences in teacher leadership at the elementary, middle, and high school levels. *Action in Teacher Education*, 19(3), 49-64.
- Sweetland, S. R., & Hoy, W. K. (2000). School characteristics and educational outcomes: Toward an organizational model of student achievement in middle schools. *Educational Administration Quarterly*, 36(5), 703-729.
- Urbanski, A., & Nickolaou, M. B. (1997). Reflections on teachers as leaders. *Educational Policy*, 11(2), 243-254.
- Wasley, P. A. (1991). *Teachers who lead: The rhetoric of reform and the realities of practice*. New York: Teachers College Press.
- Wheatley, M. J. (1994). *Leadership and the new science*. San Francisco: Berrett-Koehler.
- Whitaker, K. S., & Moses, M. C. (1990). Teacher empowerment: A key to restructuring. *Clearing House*, 64(2), 127-131.
- Yee, G., & Kirst, M. (1994). Lessons from the new science curriculum of the 1950s and 1960s. *Education and Urban Society*, 26(2), 158-171.
- Yin, R. K. (1989). *Case study research: Design and methods*. Newbury Park, CA: Sage.