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**TECHNOLOGY LEAD TEACHERS:  
PROFESSIONAL DEVELOPMENT FOR COMPUTER USE IN SCHOOLS**

by

**NANCY EILEEN MESSMER**

**A dissertation submitted in partial fulfillment  
of the requirements for the degree of**

**DOCTOR OF PHILOSOPHY**

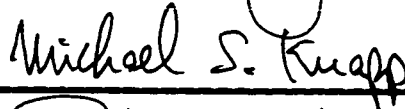
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Abstract

Technology Lead Teachers: Professional Development for Computer Use in Schools  
by Nancy Eileen Messmer

Chairperson of the Supervisory Committee: Professor Allen Glenn  
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School districts look for effective strategies to introduce computer technologies to teachers and to provide inservice education to enhance their technology skills. They hope that increased teacher proficiency with technology will lead to more effective learning environments for children. A school district in the Pacific Northwest designates two teachers per school as Technology Lead Teachers and offers them time, recognition, support, resources and training in exchange for their labor in taking care of technology issues in the building, pioneering teaching and learning with computer technologies, and helping their fellow teachers. This study examines seven Technology Lead Teachers in three elementary schools. It reports on the impact of lead teacher work on their personal learning, their teaching, and their helping of colleagues. The case studies were supplemented by surveys of school colleagues and all district Technology Lead Teachers.

Four themes emerged as the key features of program participation for the Lead Teachers; positive opportunity to learn and to help, personal recognition for an important job, long-term immersion in role, and expanded access to people and resources. Teachers took the job to learn, and learning was the focus of the experience for them, in formal classes, conferences and meetings, and in daily problem-solving. By obligating themselves to help, they said they were "forced to learn."

Issues surfaced that were troubling to district leaders and/or the Technology Lead Teachers. These included limited direct impact in classrooms, missed opportunities for networking and critical reflection, confusing multiple definitions of the role, lack of clarity about goals for the program, uncertainty about who was in charge, and questions about how to keep former Lead Teachers growing.

Being a Technology Lead Teacher is a challenging, problem-solving opportunity for teachers who participate in the program. The model is a modest and sturdy program for ongoing professional development, featuring experiential learning, collegial work on challenging issues, expanded roles for teachers, a possibility of improving learning for children, and an appeal to teacher altruism and hopefulness.

**Technology Lead Teachers:  
Professional Development for Computer Use in Schools**

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## **Dedication**

**This manuscript is dedicated to my parents, Vera and Kurt Messmer, who supported me with love and pushed me to achieve, and to my husband, Roy Morris, Jr., whose intelligence, integrity, and love provide me with continuing inspiration and strength.**

## **Chapter 1**

### **Introduction**

#### **Purpose of and Need for the Study**

School districts across the country are investing millions of dollars in computer technologies, with the major goal of improving student learning. It is expected that computers will motivate, individualize, and invigorate learning for children. Many districts have focused on teachers as the crucial link between the hopes of technology advocates and policy makers, and the experiences of children in the classroom. School districts want to provide the training and support needed to enable teachers to use and teach with technology.<sup>1</sup>

In establishing teacher training programs, districts have chosen different approaches. Some mandate training for all teachers. Others require specific competencies prior to hiring and provide linked inservice training with tests for competence among existing staff. Still others offer a wide-ranging menu of voluntary technology inservice courses. Other districts use lead teachers, who agree to model technology use and help their fellow teachers use computers in the classroom, in exchange for resources and training. Regardless of the model, little research information is available regarding the impact of any of these teacher training models on teacher learning and practice.<sup>2</sup>

The research reported here focuses on teacher response to a particular model of professional development. Specifically, it examines the impact of being a technology lead teacher on the lead teachers' abilities to learn as individuals, and their abilities to help and lead other teachers to incorporate technology into instruction. School districts adopt lead teacher models hoping to train a small number of staff and multiply and spread the learning to others in school buildings. What the lead teacher learns and makes of the role is critical to the success of the effort, but not much is known about individuals in this role, especially in the area of computer technologies. To find out what happens when teachers agree to be leaders and helpers, the research question posed here is "How does participation in a lead teacher support program aimed at computer technology enhancement affect lead teachers as learners, teachers, and helpers?" The study examines seven teachers who are part of a technology lead teacher program in a Pacific Northwest suburban school district, viewing their work in the contexts of their schools and school district, along with the responses of their colleagues.

## **Overview of Literature Base and Conceptual Framework**

Using computers to enhance learning is an innovation in school methods and practice. Many researchers believe the introduction of computers into classrooms can be a catalyst toward classrooms characterized by "active learning" and "authentic or adventurous" teaching.<sup>3</sup> Whether the goal is ambitious school reform or simply improving learning with better tools, changed classrooms involve learning and action by teachers. While there is little research to guide districts in choosing specific professional development strategies for computer implementation, extensive research is available about general issues of professional development.<sup>4</sup> As efforts to improve schools through teacher education have progressed, the field of staff development has moved from a study of effective training methods to broader efforts to improve schools by "professionalizing" teaching, which includes expanding and/or delineating varied roles teachers may play.<sup>5</sup> Several proposals have been made for increasing teacher leadership in order to improve schools, and a number of lead teacher models have been tried and researched.<sup>6</sup> A limited number of studies document the implementation of lead teacher strategies.<sup>7</sup>

As computers are becoming more commonplace in schools, research studies examine the impact in schools and count the number and kinds of technology in classrooms. Surveys have identified widespread uses and case studies have described specific programs.<sup>8</sup> Various experimental programs are in operation, and some of them yield research reports on effective practices with student and teacher use of computers.<sup>9</sup> School districts look to research and the examples of other districts in designing staff inservice programs for their teachers, but the introduction of computers into schools has presented numerous challenges. One of the greatest challenges is figuring out how to use limited resources to support teacher learning with computers over the long run. The use of technology lead teachers, who rotate in and out of the position on a two-year basis, is a promising strategy for ongoing support of teacher learning at their school sites. In order to understand the issues surrounding the adoption and use of this staff development strategy, this study examines literature concerned with (1) teacher professional development, (2) teacher leadership, and (3) teachers and technology.

Specifically, the focus of this study is on the participation of teachers in a technology lead teacher program and how their participation affects their approach to learning, helping others, and teaching. The school district hopes that working in the role of technology lead teacher will result in increased learning about computers and the learning process for the

lead teacher. The district bases this on an assumption that teachers who obligate themselves to help others, will invest more in their own learning. As a lead teacher works in the school, the school benefits by having an in-building helper and model learner. The ultimate goal of having lead teachers supporting technology implementation is to affect students in classrooms. The district believes that teachers who are learning to use computer technologies will transform their classrooms and model teaching with computers for their peers. This study examines seven technology lead teachers to find out what they do as lead teachers, their activities, attitudes, and skills, and what meaning they make of their role. The teachers' participation is influenced by the social context of their schools and district, by the characteristics of the program and by their personal characteristics, so these factors are investigated.

### **Overview of Research Methods**

Because the focus of the study is to understand the particulars of the work of each technology lead teacher and to understand what they do, how they learn and work in their schools, and what effect the role has on their teaching, a comparative case study approach was used. Little is actually known about the work of technology lead teachers and an interpretive approach was used to understand the specifics of their work and what they make of it.<sup>10</sup> As a participant observer in the district, I studied seven lead teachers in three elementary schools using observations, interviews, correspondence, and examination of documents. Each lead teacher worked in the context of their school, so interviews were conducted with each principal and two or more staff colleagues. At staff meetings, staff members answered a short questionnaire about the lead teachers and their feelings and attitudes about the program. Interviews with key administrators were held to place the program in a broader context. To understand more about the opinions and attitudes of all lead teachers in the district, I conducted a survey of all 31 lead teachers. A pilot study of one lead teacher in 1992, led to the formulation of categories of work and to the structure of interview questions.

### **Organization of the Study Report**

The study report is organized into ten chapters. Chapter 1 introduces the purpose of the study, explains the need for it, and overviews the organization of the dissertation.

Chapter 2 reviews pertinent literature about professional development, teacher leadership, and teachers and technology, followed by a characterization of this literature and identification of commonalities and gaps in the knowledge base.

Chapter 3 makes a case for studying the particular staff development strategy of technology lead teachers, beginning with an introduction to the general idea, a description of the context for the study, including information about the school district and its technology programs, and further elaboration of the context for the study and details about the Seed Teacher program, the specific model of the technology lead teacher idea developed in Vista School District. The rationale for the study is explained, and the study is described. The conceptual framework for the study is presented in graphic and verbal forms, followed by specific research questions. The chapter concludes with comments on studying the Seed Teacher program as a strategy for supporting the inservice learning of teachers.

Chapter 4 focuses on research methods, beginning with the rationale for the qualitative case study design, explaining the impact of two pilot studies on the current research, and the methods used for selection of cases. Data sources are listed and procedures for data collection and analysis are explained. Procedures are discussed pertaining to validity, reliability, ethics, bias, and reporting the results of this study.

Chapter 5 reports the results of a survey of all of the 1994 Seed Teachers. The survey results are followed by an explanation of the organization used for the following three chapters of case stories.

Chapters 6, 7, and 8 present the case reports of teachers at Cascade Park, Vintage, and Lakeland Elementary Schools. Each chapter begins with a description of the school, and follows with descriptive narratives about each Seed Teacher. Each chapter features a brief portrait of the teachers followed by their experiences as learners, helpers, and teachers. A section lists what helps and hinders them as Seed Teachers and how the role affects their relationships and status in the schools. For each school, the opinions of principals and colleagues are examined, based on interviews and building surveys. Each chapter concludes with a summary.

Chapter 9 is a cross-case analysis of all the Seed Teachers. The chapter provides a thumbnail portrait of why each Seed Teacher wanted to be a Seed Teacher and follows with reports on the supports and constraints reported by Seed Teachers on their learning, helping, and teaching. Differences in the program emerged from a look at the contexts of three schools, including multiple visions of the role, the evolution of the program at each building, what happens when a district program operates on auto pilot, the impact of

building administrators, the role of former Seed Teachers, and how to figure out a workable balance of incentives and requirements.

Chapter 10 concludes the dissertation with summary comments about key findings from literature, a description of the study and findings of the research. The important themes of the role and puzzling issues are summarized, followed by limitations of the research and suggestions for further research. Recommendations are made to school districts based on implications of the research. The chapter ends with a conclusion about where this study fits in the emerging literature on professional development for computer technology implementation in schools. References and appendices follow.

## Notes to Chapter 1

- 1 (1995; Apple Classrooms of Tomorrow, 1996; Becker, 1991; Becker, 1993a; Fulton, 1989; Hirschbul, 1993; Knapp & Glenn, 1996; Office of Technology Assessment, 1988; Office of Technology Assessment, 1995; Papert, 1993)
- 2 Keirns, 1992; McFadden & Johnson, 1993; O'Neil, 1995; Office of Technology Assessment, 1995; Sturdivant, 1989; Valdez, 1989)
- 3 (Apple Classrooms of Tomorrow, 1995; Becker, 1992; Bruder, Buchsbaum, Hill & Orlando, 1993; Collins, 1991; David, 1994; Dede, 1995b; Dwyer, 1994; Dwyer, Ringstaff & Sandholtz, 1990; Hawkins & Sheingold, 1986; Kerr, 1991; Knapp & Glenn, 1996; Knupfer, 1993; Means, 1994; Means & Olson, 1993; Means, Olson & Singh, 1995; Salomon, 1992; Sheingold, 1991; Sheingold & Hadley, 1990)
- 4 (Bradley, Kallick & Regan, 1991; Burden, 1990; Fullan & Hargreaves, 1992; Guskey, 1995; Howey & Vaughan, 1983; Joyce, 1990; Joyce & Showers, 1983; Lieberman, 1994; Lieberman & Miller, 1991; Little, 1989; Sparks & Loucks-Horsley, 1990; Wood, McQuarrie & Thompson, 1982)
- 5 (Darling-Hammond, 1990a; Darling-Hammond, 1990b; Darling-Hammond, 1993; Darling-Hammond & McLaughlin, 1995; Devaney & Sykes, 1988; Firestone & Bader, 1992; Griffin, 1991; Joyce, Wolf & Calhoun, 1993; Lieberman, 1988; Lieberman, 1994; Little, 1992; Little, 1993; Little & McLaughlin, 1993; Lord, 1995; Malen, 1993; McLaughlin, 1993; McLaughlin, 1994; Smylie, 1994; Sykes, 1990; Talbert & McLaughlin, 1994; Wise, 1990)
- 6 (1986; Bolman & Deal, 1994; Devaney, 1987; Duke, 1994; Education Commission of the States, 1983; Fessler & Ungaretti, 1994; Holmes Group, 1986)
- 7 (Lieberman, 1992; Lieberman, Saxl & Miles, 1988; Little, 1988; Miles, Saxl & Lieberman, 1988; Smylie & Denny, 1990; Troen & Boles, 1994; Wasley, 1989; Wasley, 1992a; Wasley, 1991; Wasley, 1992b)
- 8 (1995; Anglin, 1991; Bakke, 1984; Becker, 1991; Becker, 1992; Becker, 1993a; Becker, 1993b; Bork, 1993; Chambers, Mullins, Boccard & Burrows, 1992; Cuban, 1986; Dede, 1995a; Dede, 1995c; Kozma, 1991; Luehrmann, 1990; Maddux, Johnson & Willis, 1992; Office of Technology Assessment, 1988; Office of Technology Assessment, 1995; Office of the Superintendent of Public Instruction, 1994; Schrum, 1995; Sheingold & Hadley, 1990; Stager, 1995; Wiburg, 1994; Zorfass, Morocco & Lory, 1994)
- 9 (Apple Classrooms of Tomorrow, 1995; Dwyer, 1994; Dwyer, 1991; Kerr, 1991; Knapp & Glenn, 1996; Luehrmann, 1990; Ringstaff, Haymore Sandholtz & Dwyer, 1991)
- 10 Barzum & Graff, 1992; Denzin & Lincoln, 1994; Dwyer, Ringstaff, Sandholtz, Keirns & Grant, 1990; Erickson, 1986; Evertson & Green, 1986; Fetterman, 1989; Glaser & Strauss, 1967; Goodlad & Klein, 1974; Goodson, 1992; Hammersley & Atkinson, 1992; Hargreaves & Woods, 1984; Lightfoot, 1983; Merriam, 1988; Miles & Huberman, 1984; Richardson & Anders, 1994; Schubert, 1991; Spindler & Spindler, 1987; Spradley, 1980; Stake, 1994; Stake, 1995; Witherell & Noddings, 1991; Yin, 1984)

## **Chapter 2**

### **Review of the Literature**

In examining a program designed to implement computer technologies in schools, via the use of lead teachers, the pertinent areas of research are professional development of teachers, teacher leadership, and computer technologies and teachers. The examination of the growth of professional development leads to the present efforts to "professionalize" teaching and develop teacher leadership. Teachers develop leadership through the assumption of designated roles and by participating in a number of other leadership opportunities. Efforts to use computers in schools start with teachers, and the research that follows looks at the entry of computers into schools and efforts to learn from the experiments of teachers to date. The chapter concludes with consistent patterns in the research, and the identification of some gaps which suggest areas needing further research.

### **Professional Development**

Professional development for teachers has assumed increasing prominence in the past twenty years. From the beginning of public schools to the present, provisions for formal teacher learning have changed and grown. This section reviews the history of professional development from the teacher institutes of the early 1800's through the reports and commissions of the 1970's, 1980's and 1990's. First wave and second wave reform efforts of the 80's are described as both emphasize increased professional development, but from different vantage points. Teacher career stages and adult learning theory are also reviewed, and the section concludes with a description of patterns of successful professional development.

### **Learning Opportunities for Teachers: 1800's-1980's**

When public schooling began in America, teachers were young and untrained for the task. They were to teach basic skills and the rules of citizenship. Reading, writing and arithmetic were the main components of the curriculum, the content was simple and the methods of teaching were telling and directing. In the early 1800's, teacher institutes were initiated to boost the skills of teachers. These were part "inservice workshop" and part revival meeting, providing content instruction, modeling pedagogy, and stressing moral integrity and character values for the teacher. The teachers were trained to deliver a common

education. When normal schools were developed in the mid-1800's, the institutes were modified to provide ongoing inservice to practicing teachers in the form of summer normal schools, reading circles, and extension courses. In the reading circles, present in three-fourths of the states by 1910, teachers read books from the state approved lists and met to discuss them. The reading circles embodied an idea of staff development that recognized the teacher as a professional person, voluntarily increasing skills and knowledge.<sup>1</sup>

### **Scientific Management Into Schools**

By the 1900's, theories of scientific management influenced the schools. As in a factory, the task was to identify the one best and most efficient way to do a job, teach it to all workers, and enforce implementation. Methods were designed for schools, teachers were taught, and they were expected to deliver the same to students. The emphasis was on conveyance of curriculum, with goals stated and outcomes tested. Summer schools and extension courses taught teachers in this manner, and teachers were conceived of as the agents to deliver the curriculum. Head teachers and principal positions were created to supervise teachers, and control the curriculum and inservice education of the teachers.<sup>2</sup>

### **Dewey and Progressive Education**

In the first half of the century, Dewey's progressive ideas about education captured the imagination of reformers. Dewey emphasized that learners grow by solving problems, and that the job of teachers is to construct and pose increasingly complex problems as learners grow. Knowledge and ideas are constructed and reconstructed by learners and teachers alike as problems are solved, redefined, and shared. This form of education clearly requires more skill and knowledge on the part of the teacher, and represents quite a departure from the more straightforward structure and methods in place in most schools. A continuing controversy regarding its influence in schools was whether students learned as much material in Dewey-inspired progressive schools as in industrial model schools. When World War II and post-war testing showed deficiencies in the skills and knowledge of many students, progressive education methods were the target of books like "Why Johnny Can't Read and What You Can Do About It?" Although progressive education was widely blamed for the poor performance of students, probably no more than five percent of schools had ever adopted the methods, even partially.<sup>3</sup>

## **Government Curriculum Efforts**

With the uproar over poor academic skills and the launching of the Soviet missile, Sputnik, in 1957, education became the focus of national concern and attention. The federal government invested heavily in the writing of curricula in major disciplines, and in the training of teachers. The academic reform movement had at its core the idea that students and teachers should think like scholars and practice the disciplines, using the modes of inquiry most appropriate for each. Teachers and students were receivers of new concepts for understanding a discipline and new methods for working in it. Materials were designed either to usher students and teachers into the academic world of the disciplines, or they were made to be "teacher-proof" so that they could be used by any teacher and still have powerful results. Many staff development efforts involved teachers in learning to use the materials provided in the curriculum kits. Academic reformers hoped that the ideas of the disciplines and the new materials and techniques would transform schools and increase the skills and knowledge of teachers and students. There was a belief that the development of these curricula and the dissemination of them to schools was the main work, and that change would follow directly. Develop good materials, get them into schools, give the teachers a shot of training, and most students would be learning like scholars. The major thrust of this academic reform work was in the decade from 1955-1965.<sup>4</sup>

## **Conflicting Ideas About Teaching and Learning**

Americans often turn to their schools as a place for solutions to social problems. With each call for reform of schools or addition to the curriculum, it is assumed that teachers will learn the skills, discard old ways of organizing and teaching, and change in some way to accommodate the new expectation. Each reform advocate seems to think of the people currently in schools as blank slates and drastically underestimate the task of re-education.<sup>5</sup> Two major and conflicting conceptions of teaching and learning run through years of reform efforts in the United States. One emphasizes the teacher-centered, teacher-directed delivery of predetermined curricula, and the other highlights the inquiry nature of learning and the shared construction of knowledge by learners and teachers. In the first idea, the implications for teacher education involve training and supervision to hold teachers accountable for their own skills and the delivery of curricula to their students and for the accountability of students through a system of tests. The focus lends itself to a form of instruction which can be broken down into manageable bits. The inquiry theme, on the

other hand, is more complicated and difficult to parse out and test. If teachers are to construct learning environments and guide students through active problem-solving, they must be viewed more as professionals than as laborers. Their education should be ongoing, and generated from their own interests and the professional developments in their fields. The two ideas about teaching and learning alternate in prominence, and even overlap in influence. Staff development is viewed both as remediation of teacher deficits, and as helping teachers continually grow and learn. The work of the academic reform movement of the 60's contained elements of both themes.<sup>6</sup>

### **Implementation Studies Point to Staff Development**

In the 1970's and early 1980's, several reports were issued which studied the national curriculum efforts and addressed the issue of implementation. After all the time and attention focused so publicly on curriculum reform by scholars, governmental agencies, materials producers and the press, critics wondered why schools seemed so little changed. The "implementation of innovations" literature studied what happens at the district, school, and classroom levels as a new method or curriculum is introduced. Several complex and inter-related factors were found to influence the implementation of an innovation. All of the studies pointed to the critical nature of initial and ongoing staff development. Without strong staff development programs, only low levels of implementation occurred. Several factors were identified as being critical to implementation success, including institutional motivation, project implementation features, institutional leadership, and certain teacher characteristics. The Rand studies of many curriculum reform projects suggested that successful projects used both top-down and bottom-up strategies, involving participants at all levels of the educational system in the school district. The scope of a project was important. More complex and ambitious projects were more likely to succeed, the idea being that these projects excited teachers' hopes to grow professionally and affect the lives of their students.

Project implementation strategies which predicted success included well-conducted staff training and ongoing support activities. Initial training strongly effected the achievement of project goals and student performance in the short run, and ongoing support made the difference in teachers' change of practice, and assimilation of new methods and practices. Activities such as classroom assistance by local resource personnel, outside consultants, project meetings, and teacher participation in project meetings, had a major positive effect on the implementation of a project. Consultants who were available to

teachers on a continuing basis were very important to teachers, because they were available when the teacher needed them, and they provided concrete advice, related to the teachers' particular situations.

Institutional leadership is another factor found to be important for implementation success. A project director is important in the initial implementation, but the building principal is critical to long-term adoption of a project. Without the support of the principal, a project effort fades when the funding or outside support for it ceases. Good working relationships among teachers also increased the chances that a project would be implemented, and this was fostered by involvement in project decisions. Teachers with a high sense of efficacy were most successful in implementing a new project, and the high sense of efficacy was correlated to a heavy emphasis in the project on staff development and teacher participation.<sup>7</sup>

### **State Mandates in the 1970's and 1980's**

While implementation studies were identifying characteristics of successful and unsuccessful change efforts, the public focused in the 1970's on a "back to basics" approach and on accountability. The "new math" and "new science" took the brunt of citizen and political disappointment in student achievement. Between 1969 and 1974, state legislatures enacted at least 66 laws encouraging school accountability through management and budgeting reforms, planning and evaluation procedures, and statewide assessment of student performance. By 1979, all 50 states had set standards for schools or students, usually in the form of minimum competency testing. By 1983, most states passed legislation mandating features of school curricula, planning activities, evaluation procedures, and graduation requirements. The notion was that school provided too many frills and not enough substance, and that lawmakers should make schools change back to "basic" education. Teachers were viewed, not as autonomous decision-makers who designed positive learning environments, but as agents of policy makers and subject to their controls.<sup>8</sup>

### **Teacher Centers-An Invitation to Learn**

In some circles, teachers were seen to be the key to successful schools, and resources were attached to programs to assist teachers. The federal Teacher Center Program existed from 1978 to 1981. The Teacher Centers were run by local boards of teachers and

the programs were determined by teachers. Teachers were seen as adult learners and the focus was on choice and the opportunity to talk and learn with others. It was assumed that teachers were professional educators who could determine what they needed to learn and how to best accomplish the learning.<sup>9</sup>

### **Staff Development to the Forefront**

Regardless of the underlying philosophy of teacher learning, major policy initiatives of all stripes recognized the need for formalized staff development and in the 1980's, staff development "came of age." The need for ongoing staff development was widely recognized. The provision of isolated, centrally-driven, inservice programs provided during the 2-4 "inservice days" was criticized as being ineffective for curriculum adoption or more ambitious projects. A field of staff development emerged, with its own journals, conferences, books, and studies. Staff development personnel were in place in most school districts, even if their jobs also contained other areas of responsibility. School districts initiated extensive projects to improve student learning and provided widespread inservice on ITIP (Instructional Theory into Practice), cooperative learning and other practices.<sup>10</sup>

In a series of experiments, Stallings demonstrated that staff development led to changes in teacher practice, which led to increases in student achievement. The cornerstones of the model she developed were:

- \*Learn by doing-try, evaluate, modify, try again
- \*Link prior knowledge to new information
- \*Learn by reflecting and solving problems
- \*Learn in supportive environment--share problems and successes<sup>11</sup>

Along with Stallings, Joyce and Associates conducted a long-term experiment in Richmond County, Georgia, using their theory-demonstration-practice-feedback-coaching model to make the link between staff development, implementation, and student outcomes.<sup>12</sup>

### **Staff Development Defined: Survey of the Field**

In a widely cited article, Sparks and Loucks-Horsley<sup>13</sup> surveyed the field of staff development as it came into prominence. They defined staff development as "those processes that improve the job-related knowledge, skills, or attitudes of school employees" especially focused on teacher learning and activities which improve student learning.

Effective staff development practices, as identified in implementation studies conducted in the late 1970's and throughout the 1980's, are;

- 1) programs conducted in school settings and linked to schoolwide efforts
- 2) teachers participating as helpers to each other and as planners, with administrators, of inservice activities
- 3) emphasis on self-instruction, with differentiated training opportunities
- 4) teachers in active roles, choosing goals and activities for themselves
- 5) emphasis on demonstration, supervised trials, and feedback--that is, training that is concrete and ongoing over time
- 6) ongoing assistance and support available on request

### **Models of Staff Development**

Sparks and Loucks-Horsley identified five major models of staff development being used across the country; individually-guided staff development, the observation/assessment model, the development/improvement process, teacher inquiry, and training.

#### **Individually-Guided Staff Development**

Individually-guided staff development is rooted in theories of adult stages of development and learning style research. Teachers identify a need, develop a plan of learning, participate in learning activities, and conduct an assessment of their learning. This model is exemplified in the establishment of teacher centers and in differentiated supervision. Lawrence<sup>14</sup> reviewed 97 studies of inservice programs and determined that programs with individualized activities are more likely to achieve their objectives than those which provide identical training to all teachers. Research on the impact of the individually-guided models is largely based on self-report.

#### **Observation/Assessment Model**

The observation/assessment model involves various plans for observing teaching, providing feedback, and changing practice. It is based on the idea that improvement comes from reflection and analysis, that personal reflection can be enhanced by another's observations, and that observation and assessment of classroom teaching can benefit the observed and the observer. Models by Flanders, Hunter and Glickman were designed to hold a mirror up to teacher behavior so they would see how they teach and how they need to

change. Peer coaching, most thoroughly described and researched by Joyce and Showers is an observation/assessment model, but will be discussed further in the training section, as a part of a training model. The clinical supervision model belongs in this family of staff development, although the mix of feedback for improvement of practice, with evaluation for ongoing employment, is problematic. Much of the research on observation/assessment models is based on supervision and evaluation. Acheson and Gall report that a number of studies have found that teachers accept the clinical supervision model and use the process to their advantage when both parties are taught systematic observation techniques, and supervisors support teacher learning with behaviors such as asking questions, giving encouragement, and accepting feelings. A link needed in the research on most observation/assessment models is the effect on student learning.<sup>15</sup>

### **Development/Improvement Process**

The development/improvement process involves personal improvement as part of a systematic school improvement process or curriculum development plan. It assumes that adults learn most effectively when they have a need to know or a problem to solve, and involves teachers in a collective process to solve a problem. They learn by their involvement in the process. This model assumes that the people closest to a problem should solve it, and that involvement in group problem-solving is a growth experience and leads to more fitting solutions. Teacher learning is driven by the demands of the problem, and the process of problem-solving is as important as the solution. Research supporting this model comes from curriculum development studies by such researchers as Glickman and Glatthorn who argue that curriculum development promotes teacher thinking and student learning, and that the process of group work improves teacher practice. Research and theories from the implementation of innovation and change literatures support teacher involvement in school improvement work. The model begins with identification of a problem or need, group focus on the idea, and formulation of a response. The model includes such things as teachers in a school studying reading programs, and making school changes in curriculum, to identifying consistent school discipline problems, collecting data, formulating strategies, implementing new plans, and evaluating their effectiveness. After designing a curriculum or developing an implementation plan for a curriculum, teachers are sometimes hired as teacher trainers to assist their peers.<sup>16</sup>

### **Teacher Inquiry**

Teacher inquiry takes various forms, both formal and informal. It can be an individual teacher investigating a classroom practice, small groups investigating an issue, or a whole faculty process. The inquiry can happen at the workplace, in a teacher center or at a university class. The basic belief is that teachers can formulate valid questions about their practice, and design and carry out plans to answer them. From Dewey's desire to have teachers take "reflective action" to current reports of interactive research and development (Tikunoff and Ward), collaborative school research (Lieberman), and classroom action research and teacher support groups (Watts), researchers describe the benefits of teachers designing and carrying out research projects. Various approaches to individual and group inquiry are available, including quality circles, reflective conversation, structured investigation, and research conducted jointly by researchers and practitioners. The research base on the teacher inquiry model is as scanty as for the other models in terms of effects on student learning, but general benefits are assumed to be better informed teachers, more effective consumers of research, and improved classrooms from the intensive, but distanced focus teachers take when they research a problem and study solutions as they implement them.<sup>17</sup>

### **Training**

Training is the most researched and implemented, and is what many educators think of when they hear the phrase, "staff development". The underlying assumption of this model is that there are teaching behaviors and techniques which are effective in the classroom and that teachers can learn these and make changes in their practice. The training model goes hand-in-hand with effective teaching research and involves direct instruction of students and teachers. Most training is delivered in workshop sessions in which an expert trainer conducts the activities with clearly specified outcomes. The outcomes frequently include awareness and knowledge and skill development. The RPTIM model designed by Wood and Thompson by studying effective training practice, and used in many districts, involves activities for readiness, planning, training, implementation, and maintenance. The RPTIM plan assumes that training is only a part of an ongoing process of change. The importance of using peers as trainers is emphasized by many researchers, because they are working in the same context and with similar problems, and they are available for ongoing help.<sup>18</sup>

The Joyce and Showers research on training is often cited by school districts as the rationale for current practice. The researchers predict that teachers can learn various models

of teaching and incorporate these into their classroom repertoire with the end goal of effecting student achievement. They propose a training model which includes exploration of theory, demonstration and modeling of a skill, protected practice, feedback about performance, and ongoing coaching in the workplace. They advocate that teacher pairs learn together and help each other as "peer coaches," observing in one another's classrooms, providing no feedback and maximum ongoing support over extended periods of time.<sup>19</sup>

### **Expansion from Training to Institutional Learning**

Joyce and Associates conduct and collect research relating to various models of teaching and impact on student achievement. They are known for identifying effective teaching practices and implementation strategies. They say that a teacher needs to practice a new strategy at least 20-30 times before bringing it comfortably into the teaching repertoire. With participation in ongoing peer coaching pairs and study groups, the time required is less and the effectiveness in the classroom is increased. Since he began writing about school improvement, Joyce has advocated whole school focus on organizational and individual achievement, through various proposals for peer coaching pairs, study groups, and democratic school governance and study teams. He cites the recent convergence of researchers and theorists in the fields of organizational behavior, leadership, change, training, staff development and action research, as they call for an integrated approach to the improvement of schools, and a simultaneous concentration on change in individuals and organizations. Joyce notes the fragility of innovative practice in schools and the need for continual attention and support required to maintain progress.<sup>20</sup>

### **First Wave Reform Reports Challenge Schools to Change**

Staff development models have evolved through the turbulence of the 1970's and 1980's. In 1983, the "Nation at Risk" report issued a challenge to schools to change. Many national studies found schools to be lacking. Criticisms of schools were elevated to the status of national security emergency and education was once more on the national front burner. In what has been called the "first wave reform efforts", a series of centralized and bureaucratic controls were passed in federal and state arenas. The critique of student achievement led to demands for more standardization of curricula, more tests, more courses,

and more time in school. Staff development was mandated as part of the efforts to make schools change and "fix" teachers.<sup>21</sup>

### **Second Wave Reforms More of a Challenge**

Coming right on the crest of the first wave of centralized reform efforts was the "second wave" effort to reform schools. The main components of this round of reports were a need to professionalize the teaching profession and a move to decentralize reform efforts. Several reports on teaching and teacher preparation emphasized the complex nature of teaching, the skills required for teaching and the contextually-rich brew in which teachers work. The mandating, centralizing improvement strategies fell into disfavor in some research and policy circles. Restructuring efforts sprang up across the country which included issues such as "choice and voice for parents, empowerment for teachers, school-based management for both, and to a lesser extent, changes in the learning-teaching process" (Murphy).<sup>22</sup>

### **Systemic Reform and Professional Development in the 90's**

While researchers and writers sort out which wave of reform is dominant, parts of each movement touch schools at all levels. The multiple reform models present challenges which have major implications for professional development. They contain new conceptions of learning, serious commitments to diverse students, and new images of good teaching. The various reforms call for changes in standards, curriculum, assessments and instruction with fundamentally different views of knowledge and the nature, purpose, and scope of school subjects.<sup>23</sup>

### **Reforms Challenge Current Practice**

Little<sup>24</sup> identifies five reforms which challenge current practice; those related to subject matter teaching, equity among diverse student groups, student assessment, the social organization of teaching, and the professionalization of teaching. Each set of reforms makes enormous demands of current and future teachers.

### **Reforms in Subject-Matter Teaching Including Standards, Curriculum and Pedagogy**

Research on cognition and curriculum call for a change to a constructivist theory of learning and more adventurous teaching resulting in ambitious student outcomes. National curriculum standards written by various groups expect much of students and teachers, and depart from the curriculum delivery mode of the past. In the move to "teaching for understanding", teachers need to know more about their subjects, about how to teach their subjects, and how to teach in a way that students can learn in deeper, more meaningful ways. According to McLaughlin and Talbert,<sup>25</sup> teaching for understanding requires "teachers to have comprehensive and in-depth knowledge of subject matter, competence in representation and manipulation of this knowledge in instructional activities, and skill in managing classroom processes in a way that enables active student learning." Studies document the difficulty of changing accepted teaching practice and the current emphasis on teaching for understanding through critical thinking, new math standards, and whole language methods, comes to teachers alongside the continuing requirements for basic skill reforms. Various sets of reform mandates accumulate on top of and alongside each other, often conflicting in philosophy, emphasis, and effect.<sup>26</sup>

### **Reforms Centered on Problems of Equity Among Diverse Student Populations**

Equity reforms are focused on changing the disparity of achievement outcomes among student groups of varying race, ethnicity, socio-economic status, and gender. Criticism is aimed at the provision of discrete programs which focus on individual learners and their deficiencies and organizational structures which promote student failure. New research findings promote the kind of teaching for understanding emphasized above as well as changing school and classroom norms.<sup>27</sup>

### **Reforms in the Nature, Extent, and Uses of Student Assessment**

Reformers argue for more "wide-spread and rigorous use of authentic assessment."<sup>28</sup> However, technical advances in assessment have not kept pace with demands for their use, and new assessment measures have not challenged the use of widespread standardized tests as the basic measure of student and school success. Even though many teachers express interest in using more authentic measures of ongoing assessment, such as writing samples, open-ended reasoning problems, and exhibitions, these efforts are time consuming, difficult to construct and to evaluate. Scholars and

practitioners are working at the classroom, state and federal levels to define standards for demonstration of quality work and methods to assess and report on the progress of individual students.<sup>29</sup>

### **Reforms in the Social Organization of Schooling**

Efforts are underway to restructure schools. The difficulty of proceeding with a variety of reforms piecemeal has produced arguments for systemic reform which include linked sets of reforms in curriculum, teaching, standards, assessment, and teacher education, all aimed at promoting intellectually demanding instruction. Some call for restructuring toward a common set of principles, such as those in the Coalition of Essential Schools. As schools attempt to remake themselves, the job is akin to rebuilding a ship while the voyage is underway. A variety of models are emerging, but the focus in each initiative is based on local needs and opportunities.<sup>30</sup>

### **Reforms in the Professionalization of Teaching**

The focus here is on teachers' demonstrated knowledge and skills, initial and continuing certification, and the structure of the teaching career. Local efforts include assistance for new teachers, ongoing opportunities for experienced teachers, and experiments in decision-making and various career configurations. The professionalization reforms often impose a greater regulation of teachers in exchange for deregulation of teaching. The assumption is that teachers as professionals will keep up with the knowledge of their field, and use their best judgments on behalf of their clients (students). Teachers are expected to support new teachers just entering practice and to participate in the governance and improvement of their workplaces.<sup>31</sup>

### **Current Status of Staff Development in Schools**

The five sets of reforms just described obviously present a challenge regarding the need for staff development, especially for the nation's veteran teachers. The current status of staff development across the nation is difficult to assess, because few studies address the issues of configurations and cost of staff development activities on a national scale. Unfortunately, the information available indicates conditions for teachers in the 1990's are a far cry from the demanding professional environments envisioned by school reformers and researchers. Lord<sup>32</sup> describes the major features of current staff development efforts based on available literature:

- 1) Teachers rely on district-provided programs for the bulk of their professional development.
- 2) The programs and teachers' participation in them tend to be fragmented. The activities are offered by a variety of providers in an uncoordinated fashion.
- 3) In many cases, district staff serve as inservice providers, although many district level staff development positions are being eliminated as districts experience budget cuts. Remaining district-level staff have increased responsibility for a variety of projects in addition to staff development.
- 4) Central office staff use mostly "one-shot" activities, which emphasize technical skills development, with little in-building follow-up. These are often large group sessions so that they reach more teachers.
- 5) Few of the opportunities offered teachers allow them to experiment, engage in extended cooperative work, take risks or inquire into their own practice.
- 6) Most of the money spent of staff development pays for the providers and the participation of the teachers. Little money is budgeted for collegial activities such as teacher networks, study groups or learning opportunities such as institute participation or conference attendance. Support for the latter kinds of activities comes from private or grant sources when it exists.
- 7) Few teachers are satisfied with the nature or extent of the district-provided offerings. Only a small number of staff participate in more intensive or sustained programs.
- 8) Teachers rarely assume new responsibilities as a result of their participation in staff development activities. Except for a small number of mentor teachers, few teachers take on additional roles in order to help their colleagues learn or adopt new curricula. There is little evaluation of staff development efforts.
- 9) Staff development is often a political football in school districts. When an issue becomes "hot" or the focus of attention, staff development is used as the response and teachers are offered inservice in multiculturalism, AIDs prevention, effective discipline, or some issue of the moment.

The delivery of staff development activities involves millions of dollars in schools. While the expenditures for staff development are large collectively, the impact on individual teachers is small. Teachers consistently say they want subject-specific and site-specific

professional development, while the emphasis in districts continues to be centralized. The opportunities embody an instrumental view of teaching, and the activities are those which can be packaged, delivered, and sometimes measured. They are bureaucratically manageable, and equitable across teachers.<sup>33</sup>

### **Change the Culture of Schools**

Current practices stand in stark contrast to the convergence of research regarding professional development, including a focus on the culture of the school and the need to institutionalize ongoing learning and growth. As Fullan has said, "The ultimate purpose of professional development is less to implement a specific innovation or policy and more to create individual and organizational habits and structures that make continuous learning a valued and endemic part of the culture of schools and teacher".<sup>34</sup> Since the mid-1980's, many studies have identified the development of collaboration and collegiality as critical to school improvement and teacher development.<sup>35</sup>

### **Importance of Collegiality and Collaboration**

Virtually every study of implementation success features collegiality among teachers. Since educational change consists of changes in beliefs, teaching style, and materials, this can only come about through a process of personal development in a social context. Little<sup>36</sup> documented the power of collegiality. She found that schools improved when:

- 1) teachers engaged in frequent, continuous, and increasingly concrete talk about teaching practice;
- 2) teachers and administrators frequently observed and provided feedback to each other, developing a "shared language" for teaching strategies and needs;
- 3) teachers and administrators planned, designed, and evaluated teaching materials and practices together.

When teachers come to have "norms of continuous improvement," they search for new ways of making ongoing improvements. When productive collaboration occurs, teachers talk about teaching, share planning and preparation, observe each other in the classroom, train together and train each other. Rosenholtz<sup>37</sup> observed a collaborative work culture in thirteen schools she characterized as "learning enriched" or "moving". "Collective commitment to student learning in collaborative settings directs the definition of leadership

toward those colleagues who instruct as well as inspire, awakening all sorts of teaching possibilities in others." She observed that collaboration is linked with norms and opportunities for continuous improvement and career-long learning: "It is assumed that improvement in teaching is a collective rather than individual enterprise, and that analysis, evaluation, and experimentation in concert with colleagues are conditions under which teachers improve." Many experiments are underway to develop schools as learning communities, in which adults work together in many ways to improve student learning.<sup>38</sup>

Along with lessons from successful implementation efforts, are various theories about adult learning which guide decisions about professional development for teachers.

### **Adult Learning, Career Stages and Models: Implications for Professional Development**

A variety of theories have been developed to explain adult learning and development. Adults differ in their cognitive, personality, and learning styles, their abilities, and life and career stages. Each theory provides a framework for understanding why a teacher might or might not learn a new skill or change his or her way of teaching.<sup>39</sup>

#### **Dynamics of Career Cycle**

Fessler proposes a model of viewing the dynamics of a teacher's career cycle by looking at interactive clusters of factors, in the personal environment, organizational environment, and career cycle. Personal environmental issues include individual dispositions, crises, positive critical incidents, family, life stages, and avocational outlets. Simultaneously in the organizational environment, a teacher meets societal expectations, professional organizations, union membership, regulations, management style, and public trust. All of these affect the career cycle which starts with pre-service, moves through induction, competency building, enthusiasm and growth, career frustration, career stability, career wind-down, and career exit. This model emphasizes the interaction of factors in a teacher's work life.<sup>40</sup>

## **Teacher Professional Lives**

Huberman<sup>41</sup> traces teachers through their professional life cycles in order to find intersections between their lives and their needs for professional development. While it is obvious that teachers have “different aims and different dilemmas at various moments in their profession cycle, and their desires to reach out for more information, knowledge, expertise and technical competence will vary accordingly”, he makes a core assumption that there are commonalities among teachers in the sequencing of their professional lives and that particular forms of professional development are more appropriate than others.

Huberman poses a model of the teacher career cycle that includes 1-3 years of career entry, survival and discovery, followed by a period of stabilization in years 4-6. In these years, many teachers seek out learning opportunities. At about the six-year point, Huberman sees a split. Some teachers enter a time of experimentation and diversification in years 7-18, followed by a time of serenity in years 19-30, and finally in years 31-40, a winding down period of disengagement. On the other hand, after the period of stabilization, many teachers go through a time of stock-taking and interrogations at mid-career, in years 7-18. If they resolve the issues in question successfully, these teachers also experience the rest of their careers with serenity and then disengagement. If the stock-taking is not positive and the teachers stay on the job, many take a conservative turn and experience a bitter end to their careers.

Although this is an over-simplified version of the Huberman model, a question generated by it is "What factors predict successful careers?" Huberman found four factors associated with teachers who ended their careers with satisfaction. These teachers invested consistently in “productive tinkering” with new materials, student groupings, and other changes associated with work in classrooms, they spontaneously sought some form of role shift when they felt stale, they all mentioned special years and great classes who made the job worthwhile, and over-all, they felt they achieved significant results in the classroom. These findings are consistent with those from the quality of worklife literature. As Ashton and Webb said, “work is likely to be satisfying when we value what we do, when it challenges and extends us, when we do it well, and when we have ample evidence confirming our success.”<sup>42</sup>

## **Factors in Career Satisfaction**

Over the course of a career, the findings reviewed so far suggest that sustaining professional growth requires manageable work conditions, opportunities to try new roles, the chance to tinker and improve work with students, and continuing access to collegial assistance and resources. In terms of the forms of professional development, a temptation upon learning about varying cognitive styles, career stages, personality styles, is to tailor opportunities to teachers in certain categories. Some researchers argue for this kind of approach. Others, including Huberman, say the plan should be to recognize differences, and plan for varied activities which include active problem solving involving all teachers.<sup>43</sup>

McLaughlin and Yee<sup>44</sup> found that "career satisfaction for teachers hinges on the ability to pursue the personal values and beliefs that led them in to teaching--to be of service and to make valued contributions to young students." The idea of career is an individual and subjective one to most teachers. Because of this, the researchers recommend that a professional development strategy for teachers consist of a system of multiple rewards; including opportunities for lateral and temporary moves as well as for continuous stimulation and development. Two factors are critical in examining the individual's effectiveness in a career; level of opportunity (a variety of opportunities) and level of capacity (to impact the classroom and building). Schools where teachers can establish a sense of career are typically:

- 1) Resource-adequate (as opposed to resource-deprived)
- 2) Integrated (as opposed to segmented)
- 3) Collegial (as opposed to isolated)
- 4) Problem solving (as opposed to problem hiding)
- 5) Investment centered (as opposed to pay-off focused)

Adult learners need many of the same conditions for learning as do young ones; a chance for active learning, support for risk taking and reflection, and some choices in pacing and format.<sup>45</sup>

## **Patterns in Successful Professional Development Programs**

Researchers make the point that teachers cannot create positive learning environments for children if they do not experience the same for themselves.<sup>46</sup> In designing professional development for teachers, several models are proposed and experiments underway. Smylie<sup>47</sup> joins information from adult learning theory and organizational theory

in designing conditions for changing schools to promote teacher learning outcomes such as conceptual change, proactivity, critical reflection, experimentation, and innovation. He recommends;

- 1) Teacher collaboration
- 2) Shared power and authority
- 3) Egalitarianism among teachers
- 4) Variation, challenge, autonomy, and choice in teachers' work
- 5) Organizational goals and feedback mechanisms
- 6) Integration of work and learning
- 7) Accessibility of external sources of learning

This list of conditions is similar to the findings and recommendations of many researchers. For example, Fullan<sup>48</sup> proposes viewing school improvement and classroom improvement as linked together by the conception of the teacher as learner. Teacher-learners concentrate on mastery of technical skills, reflective practice, continuous inquiry, and collaboration. By focusing on the individual teacher, this model recognizes that change happens one individual at a time. Little<sup>49</sup> makes the point that "the language of reform underestimates the intricate ways in which individual and institutional lives are interwoven". Smylie and Smart<sup>50</sup> found that teachers relate to each other based on norms of independence and professional equality. Most of teachers' immediate motivations, concerns, incentives, and frustrations come from their work in classrooms, and they relate to the institution as a whole in terms of how their individual work is supported or hindered.

In many reform efforts, teachers are the targets and the objects of change. Teaching for understanding, which requires thoughtful interaction with students about important ideas, is dependent on a teacher's knowledge and skills. No reform can happen without teachers growing in their conceptions of subject matter, pedagogy, and subject specific pedagogy. The teachers growth in knowledge is a critical point. The process of professional development should reflect and embody the approach teachers are learning. "Teachers knowledge and beliefs are important resources and constraints on change. They serve as powerful filters through which learning takes place".<sup>51</sup>

### **Promising Alternatives to Traditional Training Models**

Little<sup>52</sup> finds four alternative strategies that engage teachers in inquiry and problem solving in a way that can make a difference in schools over time, including teacher collaboratives and other networks, subject matter associations, collaborations targeted at school reform, and special institutes and centers. Collaboratives involve teachers in work

on their subject and practice, access to a broader range of professional relationships, and leadership activities in system-wide structural reform. Collaboratives, networks, and coalitions involve teachers in the construction of their subject matter knowledge, not merely in the consumption of it. In school/university partnerships and professional development schools, resources and experiences are concentrated and intensified in an effort to improve schooling, using the efforts of people in various levels of the educational system.<sup>53</sup>

Other approaches to professional development which move teachers to improved practice through collegial study are informal study groups, peer observation and critique, case studies and case construction; action research; journal writing and analysis; multimedia reconstruction of classroom experiences; story construction that relates teachers' struggles and successes; teacher leadership programs; grant writing; project management, curriculum development and field testing; conference presentations; publication in professional journals; and review of national content standards.<sup>54</sup>

Lord<sup>55</sup> proposes that "the aim of professional development must be to expose assumptions about teaching (some of which are archaic and even damaging to students) and to produce productive disequilibrium in traditional concepts and daily routines."

Mclaughlin<sup>56</sup> thinks change will happen when teachers are part of active discourse communities, working continually to learn and improve both schools and classrooms. Systemic reform advocates have lofty goals for professional development and there is a considerable gap between reality for the majority of teachers and the ideas proposed here. Most proposals for change in schooling include leadership development for teachers, and considerable attention has been focused on how to do it.

### **Teacher Leadership**

A theme of national reports for a decade has been the need to professionalize teaching and increase teacher leadership, through enhanced and expanded roles. Teacher leadership has taken on several forms and is defined in a variety of ways. The call for teacher leadership is founded on the belief articulated by Wasley<sup>57</sup> that "that new leadership positions will improve the quality of educational experience students receive while simultaneously working to retain and to stretch top-quality people in the teaching profession". This section examines the recommendations of the reports, the issues raised by them, various models and definitions of teacher leadership, skills and knowledge needed by teacher leaders, the benefits and drawbacks of teacher leadership, and conditions some researchers deem necessary for success.<sup>58</sup>

### **Reform Reports Advocated Creation of Lead Teacher Positions**

Following the publication of a series of books describing ineffective teaching and learning in high schools<sup>59</sup>, and several reports detailing a projected teacher shortage, along with concerns for the skills and knowledge of current teachers<sup>60</sup>, two national reports were issued which directly focused on teachers and made specific recommendations for improving the deteriorating situation in schools. Teachers for the 21st Century<sup>61</sup> recommended that schools create more professional environments to include "professional autonomy for teachers, lead teacher positions, time for professional development, and deregulation so that school-site staff have greater opportunities to participate in the decisions affecting their schools." The Carnegie report also called for the creation of a National Board for Professional Teaching Standards, to develop standards and a mechanism to "board certify" teachers.

The second report, Tomorrow's Teachers<sup>62</sup> "recommended closer collaboration between practitioners and university faculty in the improvement of teacher training and continued teacher education, and for the development of a three-tiered career ladder for teachers that would include role differentiation between beginning teachers, professional teachers, and career professionals."<sup>63</sup> The National Governors' Association and the Education Commission of the States<sup>64</sup> also published reports insistent on the need to "professionalize" the role of teaching. These reports focused attention on teaching and on the need to create various roles for teachers within the profession, and for the creation of professional opportunities throughout a teacher's career. Using business models, the reports recommended various ideas for role differentiation, assuming that leadership roles for teachers would improve the "careerlessness"<sup>65</sup> aspect of teaching, reduce teacher isolation, invite more qualified people to join and remain in the profession, and provide more models for teacher preservice and inservice training and development.

### **Recommendations for Lead Teacher Role**

Following the Carnegie report, Devaney<sup>66</sup> further developed the recommendations for the creation of lead teacher positions. She proposed that the specifics of each role be developed at the school level, but that each should include certain objectives; such as improving professional learning opportunities for other teachers, engendering collegiality and collective responsibility among school staff members, and promoting classroom and

school improvement. She identified six arenas in which teachers could demonstrate leadership at the school level:

- 1) continue to teach and to improve their own teaching.
- 2) organize and lead well-informed peer reviews of school practice.
- 3) participate productively in school-level decision-making.
- 4) organize and lead inservice education.
- 5) advise and assist individual teachers.
- 6) participate in the performance evaluation of teachers.

Devaney cautioned that the lead teacher position should be part and parcel of "an organizational and workplace reform", so that fellow teachers would receive it as a help to them in their work and not just one more person on top of them on the bureaucratic ladder.

Berry and Ginsberg<sup>67</sup> followed Devaney's work by adding specificity to the lead teacher position. They designed the specifications, selection criteria, salary scale, and evaluation scheme for a school district implementing lead teacher positions. Their plan included all of Devaney's arenas for work except evaluation of other teachers. Barry and Ginsberg imagined that lead teachers would be a significant force in "defining what good teaching is, establishing standards by which to assess the quality of teaching, and helping to enforce those standards." They also believed that a lead teacher concept would work only if other incentive plans were in place for other teachers based on student achievement.

The lead teacher concept fit in with a variety of plans to create career ladders, career lattices, staged career positions, and merit pay for teachers. Merit pay and proposals for more layers of bureaucracy in teaching have not been well received in schools. Teachers have resisted the creation of hierarchical positions, but they want to find more powerful ways of facilitating learning for their students. They want to stay in the classroom and they want to collaborate. They do not wish to compete for honors and positions. Discussions of lead teacher positions have broadened to include various models of teacher leadership and even different definitions of leadership.<sup>68</sup>

### **Lead Teachers in Schools**

Teachers have always assumed leadership roles in schools, including department head, grade level coordinator, program director, head teacher, and team leader. The traditional roles have ensured efficiency and effectiveness of current practice, working in coordination with the school administration. They can be key positions for maintaining the status quo or working toward reform. These positions and others are under scrutiny.

Researchers have studied lead teachers as they have created roles for themselves in their schools, many based on the Carnegie recommendations written by Devaney.<sup>69</sup>

### **How Lead Teachers Support Peers**

In a study of teachers in designated teacher leader positions, Lieberman, Miles, and Saxl<sup>70</sup> found that they all functioned in similar ways to support their peers by:

- 1) Placing a non judgmental value on providing assistance
- 2) Modeling collegiality as a mode of work
- 3) Enhancing teachers' self esteem
- 4) Using different approaches to assistance
- 5) Building networks of human and material resources for the school community
- 6) Creating support groups for school members
- 7) Making provisions for continuous learning and support for teachers at the school site
- 8) Encouraging others to take leadership with their peers

When leaders assume specific roles, they can be considered as models and as learners, who model learning and leading. Most teacher leaders say that the most important thing they do is act as a resource and helper for their fellow teachers.

### **Skills and Knowledge Needed by Teacher Leaders**

When Lieberman, Saxl, and Miles<sup>71</sup> studied a large group of teacher leaders, they discovered that despite starting out with strong teaching skills, experience in curriculum development, impressive academic pursuits, and possessing administrative or organizational skills, these teachers had much to learn in coping with new teacher leadership positions. They all experienced, as if for the first time, the experience of school culture as structural isolation. They had to deal with the "egalitarian ethic" held by most teachers. The teachers learned a variety of skills for gaining acceptance by principals and other teachers, and they worked hard to undo the isolation.

The teacher leaders worked to make their workplace better and they learned a great deal themselves. The personal learning was in the "areas of technical learning about teachers, instruction, and curriculum; the social learnings about schools as social systems, including how to build collegiality and manipulate the system to help teachers do a better job; the personal learning about their own professional competence as they learn new skills and abilities and find new approaches to being a leader among their peers; and even, in some

cases, the satisfaction of learning how to create structures that alter the culture of the school".

The teacher leaders had to adapt to different contexts in which they learned from both their new role and the context of their particular program. They struggled with the expert/colleague dichotomy, experienced enormous personal learning, and found that building collegiality is a complicated process. The researchers looked for what process and content skills they needed and used. Six emerged as critical to the success of their work:

1) Building trust and rapport

Teacher leaders figured out what they could realistically do in the school, explained this to teachers, and negotiated their roles over time. The leader must come to be seen as legitimate and credible. The leaders demonstrate expertise, address resistance, engage in open supportive communication, build a support group, and develop shared influence and productive working relationships

2) Organizational diagnosis

3) Dealing with the change process

Leaders promote collaborative relationships, and learn confrontation and conflict mediation skills

4) Using resources

Teacher leaders built resource networks. They played a brokerage function and then followed it with assistance.

5) Managing the work

Leaders developed administrative/organizational skills. All of the teacher leaders shared a bias for action. They modeled specific new techniques, promoted a general vision of more productive ways and maintained momentum.

6) Building skill and confidence in others

Leaders learned to do individual diagnosis and monitoring of colleague needs in the classrooms.

The teacher leaders found ways to create structures for teachers to work together, to focus on the problems of their school, and to enhance their repertoires of teaching strategies. They tried to expand the leadership team in a school and find new ways of organizing to create open collaborative modes of work to replace teacher isolation. Lieberman, Miles, and Saxl studied this particular set of teacher leaders in order to isolate skills needed by change

agents, so that training materials and opportunities could be created to support other teachers in these roles.

### **Models of Teacher Leadership**

There are various conceptions of teacher leadership. Some involve power over colleagues and some are distributive models emphasizing collaboration and support.

Teacher leadership can include:

- \*leadership positions of authority
- \*team teaching and flexible employment options
- \*leadership through expanded roles
- \*lateral and temporary leadership moves
- \*participation in group decision making
- \*leadership through action research
- \*participation in outside professional groups
- \*participation in a professional development school

Teacher leadership is expressed in designated teacher leader roles, and in activities in which many individuals develop skills.<sup>72</sup>

### **Expanded Teacher Roles**

A much used option is leadership through expanded roles. Teachers take on committee leadership, act as inservice providers to staff members, become resident experts on a curriculum or skill, assist others as subject area specialists, or work as mentor teachers for new staff members. Teachers may receive alteration in their work schedules or may take extra benefits in the way of pay, materials, training, and extra paid days.

Expanded roles may or may not be combined with lateral and temporary moves. Teachers might have half-day releases to work on administrative issues with the other half in their classroom. Teachers report that the opportunity to move in and out of classroom assignments is valuable to them. A teacher might work as a subject area specialist or staff developer at the district level for several years, and move back to the classroom. Studies of veterans show that this kind of mobility is important to teachers who want to continue to grow and change, while remaining teachers.<sup>73</sup>

### **Developing Leadership in Individuals and Groups**

Team-teaching and flexible employment options provide a way for teachers to take control of their work times and configurations of learners and options. Current reports from restructuring schools often include teachers choosing to organize their teaching and their time in different ways. By experimenting with these dimensions of schooling, and working with colleagues, teachers exercise leadership. Another area of leadership for teachers is participation in site-based decision-making. As teachers work together with administrators, parents, and other members of the school community, they broaden their scope of concern and develop leadership skills.

Action research projects provide teachers individually or in groups the opportunity to study and reflect on a question of practice. These projects can be a key to continued improvement efforts. They are often part of participation in a professional development school, in which practicing teachers work with university staff to educate and mentor new teachers. The whole process of studying teaching and learning provides leadership opportunities for veteran teachers.<sup>74</sup>

Teachers assume leadership positions in professional associations impacting their jobs, including teacher associations, subject area groups, job-alike groups, and professional networks and collaboratives. These involvements can provoke improvement in individual teaching, in school-wide improvements and in broader contexts.<sup>75</sup>

### **Expanding View of Leadership**

As the study of teacher leadership has developed, different definitions have evolved. From the initial description of formal lead teacher roles, a more inclusive model of teacher leader has emerged. Lieberman<sup>76</sup> describes leadership as a set of functions rather than a formal role, which can be accomplished by a variety of people. Miller<sup>77</sup> emphasizes that teacher and student learning are interwoven, and that just as teachers are leaders with students, in creating positive learning environments, so they are leaders with their peers. Yee and Little<sup>78</sup> found that teachers are more interested in enlarging their own roles and enhancing the professional aspects of their careers, than taking a hierarchical stance in relation their peers.

In this evolving definition of leadership, teachers develop expertise according to their individual interests. They feel professionally independent but they are part of a working team. No one has higher professional status, and a range of roles of leadership are offered to all. The role of teacher leader is inclusive, rather than exclusive. According to

Belenkey<sup>79</sup>, this view of leadership taps into the embedded norms of teacher equality and honors the norms of inclusivity, connectedness, and collaboration identified with the predominantly female teaching force.

### **Benefits and Drawbacks of Teacher Leadership**

#### **Benefits**

The expansion and growth of various teacher leader roles has been of enormous benefit to the individuals who hold the positions, but does not seem to have effected the profession as a whole. Teacher leaders report that they learn a lot, enjoy the opportunity, value the chance to share ideas and accumulate resources, and some appreciate the recognition or extra salary for work they feel like they were doing anyway. For most teacher leaders, the role is a chance to take a step out of the classroom box and view the school and profession as a whole. Usually their conceptions of the complexity of the work and organization are changed. The roles are "boundary spanning"<sup>80</sup> as teacher leaders work with other teachers, administrators, central office staff, and university staff.

Boles and Troen<sup>81</sup> describe their work as teacher leaders in a professional development school, as they work with a local university to create a system in which student interns work continuously with veteran teachers, providing learning time for the veterans. The teacher leaders are role models who facilitate the development of those around them, challenge the status quo, and have influence in domains outside the classroom. Boles and Troen feel that leadership among teachers must be entrepreneurial, experimental and generative.<sup>82</sup>

#### **Drawbacks**

There are many frustrations and tensions in teacher leadership, especially when it involves the creation of separate, defined roles such as master teacher or lead teacher. Most teacher leaders experience great personal learning, but eventually they are tired, over-committed and worried that they are not doing the best they can at teaching or leading. Many positions involve half-time teaching and half-time leading. Most teacher leaders are concerned about the impacts on their classroom teaching and students, from time out of the classroom, time with substitutes, or reduced time for preparation and assessment.

In addition, teacher leaders experience many role conflicts in relation to their peers. While they want to be perceived as an expert or a person with recognized expertise, they

also want to be "just one of the group." They are often frustrated by the ambiguity of assignments and general confusion about what the leaders are really supposed to do. Teacher colleagues question the time out of the classroom. Time and access are critical issues as they cannot work with colleagues when colleagues want to work and have energy. Leaders spend their time meeting with administrators and working on non-support tasks because these are the things they can do when classes are in session. Most teacher leaders studied by Smylie<sup>83</sup> said they were facilitators, enablers, helpers for teachers, and catalysts for individual teacher improvement, but the bulk of their time was actually spent on their own training, and in meetings.

Teacher leader positions challenge patterns of power, practice and belief. As a profession, teaching is characterized by its members' strong commitment to norms of equality, autonomy, and privacy. The leaders often play it safe and do not challenge in-place norms. The concern that leaders have about breaching norms and altering prevailing patterns of practice and authority within the school may be exacerbated by the ambiguity associated with teacher perceptions of leader roles. The "individual appoint, anoint, and training" approaches may be inadequate to successfully develop teacher leadership roles. Little and other researchers fear that teacher leaders so compromise and hide their expertise as to be almost invisible.<sup>84</sup>

While the positions provide career options that allow excellent teachers to remain in classroom, these teachers often feel that they are shortchanging their students. Initially the experience with leadership roles is energizing, but then teachers get tired, there is an escalation of work pressures and the creation of role conflicts. Malen<sup>85</sup> identifies the ambiguity of assignments, distress by the collegial censure, and a feeling of being torn between classroom and leadership duties as being problematic. Troen and Boles<sup>86</sup> say that many teachers are reluctant to think of themselves as leaders. The lead teacher roles are at best a mixture of positive and negative experiences and learning.

### **Conditions For Success in Developing Teacher Leadership**

As a result of studying teacher leaders of many types, researchers have identified some conditions necessary for their success. The form of teacher leadership roles may be inadequate, so attention to the structure of the roles and the organizational context in which they are set is necessary, along with scrutiny of the school patterns which shape the roles and mediate their success. Change needs to occur in all teachers as they define what it means to be in the teaching profession and part of a school staff.

In judging how teachers might lead each other in formal positions, Little<sup>87</sup> says there are two major questions to answer. "Is the culture of the school conducive to leadership by teachers when teachers are in one another's classrooms for purposes of seeing, learning from, commenting on, and planning for one another's work with students?" and "What latitude will teachers accord a colleague who is clearly recognized as a 'master teacher'?" Little observes that in contrast to the stereotype of the closed classroom door, "the door opens, it appears, to colleagues and other observers who will neither waste the teacher's time nor insult the teacher's intelligence. The door remains open when full professional reciprocity is established--when observers work as hard to understand and describe classroom events as teachers are working to plan and conduct them."<sup>88</sup> Conditions that may promote teacher leadership positions include making sure that the work the leaders do is valued, important, and difficult; that the symbolic roles they assume are those of dignity and exemplary teaching; that concrete ground rules are established for the roles; that the incentives and rewards favor collaborative work over independent work; and that there is continuing policy and administrative support for the roles.

## **Guidelines**

When teacher leadership means teachers in a leader role, researchers provide several guidelines:

- 1) Teachers must be engaged in the creation, selection, evaluation and reconstruction of the positions intended to serve their needs. Leaders work with willing colleagues, and there is shared agreement on the need for change. The roles are flexible enough to provide different kinds of collaborative relationships for a faculty with diverse needs.
- 2) Teachers must find time to work together. Some schools propose a schedule based on teacher experience in other countries, in which a teacher's work time is split between whole class instruction, conference time with students, and individual and group planning and learning time. To this end, schools experiment with various reconfigurations of the school year and the school day to find time for teachers to work together regularly and frequently.
- 3) Mechanisms need to be created and maintained for good communication between teacher leaders, administrators, and other teachers.
- 4) The leadership roles should be part of an overall vision and set of values that accepts and expects teachers to participate in leadership. Their should be a

specific structure for the work, but the structure is not universal and is determined at each work site. Leadership can include designated roles or group participation in decision-making, curriculum development, or inservice. It should be part of an ongoing process of evaluation of the school.

- 5) A general supportive ethos is necessary in the school, teaching and leadership are complementary functions, and it seems natural for teachers of young children and youth to teach adults.<sup>89</sup>

Lead teacher roles and increased hierarchical structures in teaching were recommended by several reports, but do not seem to be the roles embraced by schools. Various expanded roles are being tried and researched. Leadership roles are used by districts bring technology into classrooms. An examination of issues regarding teachers and computer technologies concludes with an idea to designate and support technology lead teachers as a strategy for computer implementation.

### **Teachers and Computer Technologies**

As electronic technologies have become a part of American life and schools, many claims have been made for improvement of education through the use of new technologies.<sup>90</sup> If students are to use computers for learning, then teachers are the key to their use. As Glenn and Carrier<sup>91</sup> have said, "It is the teacher who makes most of the critical decisions about instruction. Schools may change in the future, but for the immediate future, one teacher working with a class of students will remain the dominant method of organization and instruction. How the teacher views technology and his or her preparation to use technology to instruct, manage, and evaluate are crucial to the better use of technology in the curriculum."

This section examines technology with a focus on the teacher, examines the state of technology in schools generally, and examines some isolated examples to explore potential uses of technology to improve instruction, facilitate personal productivity and daily tasks, and enhance professional development. Teachers implementing technology face many barriers, including organizational structures, lack of vision, material resources, time constraints, and inadequate training and support. Following a look at these barriers are recommendations from various researchers and school districts for meeting the training, support and resource needs of teachers.

## **Snapshot of the Present**

Computer technologies are in schools and their numbers are increasing. Recent reports by the Office of Technology Assessment (OTA), Quality Educational Data (QED), and Henry J. Becker indicate that schools collectively acquire massive amounts of new technologies each year.<sup>92</sup> In the spring of 1995, OTA<sup>93</sup> estimated that there were 5.8 million computers in schools used for instruction, about one computer for every nine students. Most schools have some access to television and videocassette recorders, and 41% of teachers have televisions in their classrooms. While the collective numbers are large, individual access is limited. "Only one teacher in eight has a telephone in class and less than 1% have access to voice mail. Classroom access to newer technologies like CD-ROM and networking capabilities are also limited. While 75% of public schools have access to some kind of computer network, and 35% of public schools have access to the Internet, only 3% of instructional rooms (classrooms, labs, and media centers) are connected to the Internet."

While there are computers in schools, most teachers report that they rarely or never use computers for instruction, and have not been trained in use of the tools, or educated in how technologies can improve learning and teaching. Most technology funds are spent on hardware and software, with little left over for training and support. On average, districts allocate 15% or less of their budgets for teacher training.<sup>94</sup>

In this report, the words "electronic technologies" and "technology" refers to computers and peripherals, video, networks, and telecommunications. Computer technologies in schools include computers, scanners, printers, CD-ROM players, data storage devices, and digital cameras. While schools nationwide average one computer for every nine students, there is great variability in student/computer ratios among schools and districts. Schools with small numbers of students tend to have the most computers per student. The age and power of the computers in schools is a concern. As of 1992, one-half of all computers used for instruction in K-12 schools, were older Apple II computers which are not capable of running most new applications.<sup>95</sup>

Two-way communication equipment in schools includes telephones, modems, and fax machines. Only one teacher in eight has a telephone in the classroom that can be used for out-of-building calls and less than 1% of the teachers have voice mail. Telephones are a basic communication device in families and businesses, and the fact that most teachers do not have convenient access to one during the school day hinders their communication with parents and each other. In 1992, 38% percent of all schools had a modem which teachers

and students could use, with double the number of high schools having access as elementaries.<sup>96</sup>

Telecommunications networking includes local and wide area networks, linking computers to each other and to outside resources, including the Internet. In February 1995, the majority of schools (75%) had computers with some networking capabilities, and 40% of these report that classrooms have this capability. Of schools with networking capacity, 35% have access to the Internet, and 14% have access to other types of online services such as *Prodigy* and *America Online*. Of the schools with Internet access, only 3% have the access in instructional areas such as classrooms, media centers, and computer labs. In other words, most students and teachers do not have access to Internet services at school.<sup>97</sup>

Video resources include television, direct broadcast, cable and satellite-delivered programming, videocassette recorders, video cameras and editing equipment, and videodisk equipment. Nearly every school has one television for instructional use and video is the most common technology used in schools with students. Schools typically have several televisions and VCR's and teachers use these to show commercially produced programming to students. Interactive technologies are coming into schools more slowly.<sup>98</sup>

National statistics about technology use do not convey the variability in installation of equipment and implementation of uses. There is a huge imbalance among schools in availability of technologies, and type and power of equipment. A minority of schools use technologies extensively, and it is to these we look for ideas about the potential uses of technology for improving schools.<sup>99</sup>

### **Potential for Improving Education**

An examination of current teacher use of technologies in a few schools reveals the potential for improving instruction, increasing personal productivity, easing daily tasks, and enhancing professional development. Teachers in schools with ready access to equipment and support have improved their practice.

The reason most teachers give for teaching is to assist students in their learning. Similarly, accomplished computer users list their greatest motivation as the improved learning of their students. Specifically, electronic technologies bring new teaching tools to the classrooms, introduce a wider array of learning resources to students, enable teachers to better individualize and meet student learning style needs, act as a motivator for students, and facilitate changes in the beliefs and practices of teachers.

## Improve Instruction

With increased access to technology, teachers gain new ways to lecture effectively, present material, and illustrate concepts and information. They use projection devices hooked to their computers to display student work or guide learners through a presentation. With video and videodisk technologies, learners see history come to life or view demonstrations. It is the use of technologies as teaching tools, which has captured the imagination of technology enthusiasts for years. While it is an open question whether widespread use of computer technologies actually improves student learning, the possibilities are exciting to teachers and school observers. Advocates of radio and television in classrooms have been enthusiastic about bringing instructional tools to the classroom to assist teachers. By connecting to distance learning projects, students learn from teachers in other sites, or see video demonstrations of an experiment before they do it themselves. Teachers use videodisk databases like the *Video Encyclopedia of the Twentieth Century* to create presentations on specific periods of history. Electronic technologies enable teachers to enhance their presentations of material to students.<sup>100</sup>

Electronic technologies also bring a wider array of resources directly to students. With the use of the Internet, CD-ROM databases, searchable indexes, online libraries, video and videodisk libraries, students search for information and images. In using word processors, databases, spreadsheets, cameras, digitizers, and other tools, students represent their learning in a variety of formats and present it to others. After students research a topic, they prepare a written paper, construct a hypercard stack containing their information, produce a video presentation, put the information on a home page on the World Wide Web, or produce a group presentation on a program like *Powerpoint*. Their productions may be in text form only, or may contain animations, images, and video representations. The capacities for finding and retrieving information, and for producing reports are greatly enhanced with new technologies. As Dede<sup>101</sup> says, instead of searching for two or three sources to write a report, students of the future will need to "dive into a sea of information, immersing themselves in data to harvest patterns of knowledge just as fish extract oxygen from water via their gills." When students have access to enormous amounts of information, they will need teachers to help structure their immersion experiences. Current access to a broad array of information retrieval and production tools is limited, but growing each year.<sup>102</sup>

Classrooms and schools equipped with a multiplicity of electronic tools enable teachers to individualize instruction and to accommodate individual learning styles.

Students have more options for discovery and presentation of materials. In addition to hearing information, reading in books, viewing static chalkboard and bulletin board displays, they experience media presentations. They may replay a lesson if they are absent. In schools favoring integrated learning systems, students work through computer based lessons targeted to their skills and instructional needs. Some teachers prefer teaching with computers so that they can group students for projects, and have some students engaged and busy while they work with others. Lessons delivered with the help of electronic media can be multi-modal and interactive, and many teachers report that more students are engaged and active.<sup>103</sup>

In schools studied by Means and Kerry, there was an added value to learners of working with the tools of the adult world. In addition to the motivating effects of enhanced presentations and enabling tools, students felt like they were using real-world equipment and tools, which increased their motivation for learning.<sup>104</sup>

### **Increase Personal Productivity and Enhance Daily Tasks**

Technology offers time-saving approaches to many of the tasks teachers do in the course of their work. OTA found that teachers, like all professionals, will use technology when they see that it makes them more productive and enables them to be more professional. Teachers with access to technologies report being more efficient in the performance of administrative tasks, and able to spend more time on educational planning. Teachers use electronic technologies to assist with record keeping and various administrative tasks, work analysis, assessment, to access information and prepare curriculum materials, and to increase communications.

Teachers regularly need to collect and report information about things like attendance, health issues, and lunch counts, which are communicated to other entities in the school. These tasks are facilitated on school networks. By reviewing calendars, student databases, meeting logs, etc., teachers analyze what they have done and what they need to do next. They chart and report on activities and/or behaviors.

All teachers track the learning of their students, and some use computer tools to assist in this task. Automated grading programs store information, compile and compute grades, and print reports. In Washington state, teachers receive information about their new students from the regional information processing cooperative, input this information to their grading program, keep and compute grades for a grading period, and then upload the information back to the regional cooperative for permanent record-keeping. New

assessment tools are being designed which allow teachers to identify desired student behaviors, program these outcomes into portable input devices, feed the information into a computer program, and chart student progress. Ongoing assessment and record-keeping are a standard feature of integrated learning systems. Teachers and software companies are designing programs which allow students to create electronic portfolios containing multimedia representations of their work, writing, art work, videos, and extended projects. Schools are experimenting with storage media, so that student portfolios follow them up through the grades in school.

With electronic technologies, teachers are able to access a wealth of information and prepare their own curriculum materials, ranging from hand-outs and quizzes to video clips or choreographed sequences of lessons with laser disks, video and still images. They retrieve lesson plans from electronic databases, and find support materials in a variety of formats.

Enhanced communications systems and tools enable teachers to communicate inside and outside of school. Teachers are able to write and store correspondence with parents, use electronic mail to do the same, and with voice mail, teachers can leave nightly homework assignments, announce upcoming events, and receive messages in an efficient and timely manner. Enhanced communications capabilities are among the most valued by teachers, as they appreciate being in touch with students and parents, and especially with peers in and out of the schools.<sup>105</sup>

### **Enhance Professional Development**

Electronic technologies enhance professional development for teachers by increasing communications and collegial exchanges, enabling group work, expanding the range of formal learning opportunities, increasing skills, and facilitating curriculum development. Teachers link electronically with each other through various projects, addressing curriculum areas or job-alike concerns. Counselors in Wyoming meet regularly on a video network to increase their clinical skills and discuss areas of interest. Teachers post lesson plans, share curriculum materials, and communicate with experts in their fields via e-mail or the Internet. Group projects are facilitated online, and up-to-date information is accessed by teachers working together.

In addition to courses and inservices in their districts, teachers access courses through broadcast television, computer networks, or satellite television. These media also make it possible for class participants to stay connected in informal networks. School

districts in Washington state access state essential learning requirements on the state education department's World Wide Web home page. Current information is thus at a teacher's fingertips.

The one-size-fits-all workshop, often used for inservice in schools, is particularly ill-suited to learning computer technologies. Most teachers need time for hands-on training with hardware and software, curriculum specific applications, and follow-up support. Districts across the country are trying out various plans for ongoing education and support.<sup>106</sup>

### **Changes in Belief and Practice**

Several studies have indicated that with sustained use of computer technologies, teachers change their beliefs and practices. This is usually spoken of as moving from being a "sage on the stage" to being a "guide on the side." Instead of giving knowledge to children, teachers set up active learning environments and structure problems for children to solve individually and in groups. The teacher acts as a facilitator and coach to assist the problem-solving of students.

Studies which describe a shift in teacher belief and practice include one of accomplished computer-users by Sheingold and Hadley<sup>107</sup>, a study of technology-infused classrooms by Kerr<sup>108</sup>, and research studies about the Apple Classrooms of Tomorrow<sup>109</sup> (ACOT). These researchers found that teachers altered their expectations of students, the role they played in the classroom, and their ideas of what can be learned in school.

### **Change in Teaching**

Sheingold and Hadley<sup>110</sup> conducted a large nationwide survey of teachers reported to be accomplished computer-using teachers, with access to extensive technology and using the computer as a multipurpose tool. The teachers said that using computers changed their teaching, especially in altering the roles they play with their students. It took these motivated and pioneering teachers five to six years to feel that they had developed expertise in teaching with computers. They were most motivated by the increased learning of their students, the support and collegiality they experienced in their schools, and by having access to enough technology.

In a study of computer intensive classrooms, Kerr<sup>111</sup> found that, if supported with encouragement, time, and resources, teachers changed the organization of their classrooms and worked in ways they considered more professional and effective. Classrooms became

more activity based, with learning centers and project-based learning predominant, and there was a shift towards student ownership of the learning process. The introduction of computers allowed teachers to group students in a variety of ways, and most teachers described their new roles more as facilitators, coordinators, and coaches, than as traditional teacher/lecturers. Teachers believed they could try more ambitious projects and conduct several activities at once. Kerr suggests that while technology allows teachers to do their current jobs more efficiently, the more lasting result might be that introduction of technologies will provide a fulcrum for classroom change.

Apple Classrooms of Tomorrow (ACOT)<sup>112</sup> is a research and development collaboration among public schools, universities, research agencies and Apple Computer. ACOT projects have included specific short-term projects in classrooms, as well as ongoing, longitudinal studies. The ACOT research shows that teachers change in the ways they think about and provide opportunities for students to learn. However, without developmental opportunities, most teachers use technology to support their traditional teaching patterns and achieve some gains in productivity, but little else.

### **Changing Teaching in Evolutionary Stages**

In its longitudinal studies, ACOT observed that students and teachers go through an evolutionary process as they increasingly use technology in the classroom. Five stages were identified: Entry, Adoption, Adaptation, Appropriation, and Invention.<sup>113</sup> In the Entry stage, teachers adapt to the changes in physical environment with the addition of computers. They learn to run the computers and try to run their classrooms as usual. Teachers experience many of the problems they encountered in the first years of teaching, including classroom discipline, resource management, and personal frustration.

In the Adoption stage, teachers figure out the basics and try to support their traditional text-based, drill and practice instruction with computers. Although there are physical changes in the classrooms, whole-group lectures, recitation and individual seatwork continue to be the predominant activities. Teachers gradually move into the Adaptation mode as they integrate the computers into their classroom practice. While many classroom practices remain the same, students use word processors, databases, graphic programs, and computer-assisted programs. Teachers note productivity gains in their own and their students' work. They comment on the speed and efficiency gained with the use of computers and on student involvement and engagement with the use of the computers.

The change to the stage of Appropriation is signaled by personal mastery of the technology. The ACOT researchers note that this stage has been rare because of the limited

access to computers in American schools. Teachers and students start using computer technologies in their own ways, for their own purposes. Mastery paves the way for use of different instructional strategies in the classroom. Team teaching, interdisciplinary project-based instruction and individually paced instruction become more and more common at the ACOT sites. Teachers and learners work together collaboratively. The most important part of this stage is the personal examination of beliefs about teaching and learning by each teacher. The final stage of Invention is characterized by teachers more completely adopting constructivist approaches and inventing new ways to organize learning activities. The ACOT studies confirm what earlier researchers found, that with support and access, teachers do change their beliefs about learning and teaching, and their actual classroom practice.

### **Needs for Training and Support Evolve**

The kinds of training and support needed by teachers change as they evolve through different stages. "Corresponding to the gradual instructional shifts are changes in the frequency and form of collegial interaction. At the beginning of the project, interaction was infrequent and focused on emotional support. Over time, teachers' interactions shifted to include technical assistance, instructional sharing, and eventually, formalized collaboration."<sup>114</sup> All across the country, motivated teachers demonstrate the power and potential of computer technologies to improve instruction, increase productivity, enhance professional development, even change the way teachers believe and organize classrooms. Accomplished computer-using teachers and novices face a number of barriers which inhibit their use and learning with computers, and which they must overcome.

### **Barriers To Effective Use of Computer Technologies**

Teachers face a variety of barriers as they attempt to use computer technologies, including inadequate access to appropriate equipment, shortage of time, lack of training and support, organizational barriers, and a variety of other teacher concerns.

#### **Lack of Material Resources and Functional Access**

A look at computers in classrooms reveals that there are not enough to make much of a difference. Most teachers do not have regular access to a powerful computer, especially one which is networked and linked to the Internet. In a minority of school districts, teachers

are given a computer for home in exchange for training, or are provided with school workstations. Unfortunately, most teachers do not have this luxury, as they face old, not-so-powerful, stand-alone computers with various kinds of software. Teachers who want to use computers with students (who usually come in sets of thirty) find that they are using a variety of computers with different systems, software, versions of software, and memory needs. Printing student work can be a major challenge.

Funding for technologies is usually a problem. Technologies are often purchased with one-time-only bonds or levies, which pay for hardware, but not for software, materials, maintenance or support. Many times, computers are purchased for schools one at a time by the school PTA. So the problems with funding include lack of initial funds, lack of ongoing funds to support technology investments, limitations on current funding in certain categories, and unequal expenditures in schools.

Technical maintenance and support of computer technologies is a problem in many school districts. Computers are often purchased with capital funds and no money is allocated to support their use over time. School districts have not developed the technical infrastructure that is routinely in place in most businesses. When computers and peripherals break, they may not be fixed in a timely way. Budgets are not in place in many districts to have adequate supplies of printer cartridges, extra cables, paper, and extra parts. Many districts have viewed computers as they did televisions or movie projectors, assuming they had a life of so many years and not budgeting for upgrades of systems, memory, new software, or updated peripherals.<sup>115</sup>

Schools have also struggled with issues related to large numbers of students using the same machines, including vandalism (stolen mouse balls, pornographic sounds at start-up, key caps removed), problems with saving student work, viruses, altered desktops, imbedded swear words, and the innumerable things that can bedevil the teacher who combines large groups of children with assorted computers in compressed periods of time.

### **Teacher Time Constraints**

In contrast to teachers in other countries, most of American teacher time is spent in direct instruction of students. For the average teacher, paid time for collaboration, planning and learning is confined to a half-hour before and after school and two, three, or four inservice days a year.<sup>116</sup> It takes time to learn to use electronic technologies, for personal productivity and for teaching. Even accomplished computer-using teachers who are highly motivated say that it took them up to five years to comfortably use computers for teaching.

It takes time to design activities or adapt those designed by others, try them out, and get feedback. It takes time to observe other teachers and learn exemplary uses of technology for learning. It takes time to learn to use new equipment and new software, to be comfortable navigating in unfamiliar worlds. Many current teachers attended college when libraries used card catalogs and kept track of circulating books with card files. They need time to be personal users of technology and then to figure out the pedagogical moves to use technologies with groups of students. Lack of time to learn and experiment is the greatest barrier to computer implementation cited by most teachers and observers of schools.<sup>117</sup>

### **Lack of Training and Support**

Most teachers report that they have not had suitable training to prepare them to use technology in their teaching. The majority feel inadequately trained to use any technologies personally, much less to teach with them. While teachers say that students should learn to use technology in the course of their schooling, some are not so sure that it is a skill they personally need to acquire.<sup>118</sup>

As with all forms of innovation and change in schools, staff development is a critical need. Almost ten years ago, Cuban declared that "Teacher training is the gateway to effective utilization of the powerful computer technologies."<sup>119</sup> OTA has found through the years that investments in technology cannot be fully effective unless teachers receive training and support.<sup>120</sup>

Teachers need a variety of learning experiences to use and then to teach with computers. Even experienced technology-using teachers find themselves preoccupied with trouble-shooting hardware and software problems, rather than assisting students in their learning activities. Teachers in the classroom need technical assistance and help with teaching with technology. Teachers need pedagogical support such as advice on choosing relevant software and integrating it into a specific lesson, suggestions for ways the technology can be used to meet particular curricular goals, and advice on organizing the whole class to use limited resources. Teachers need help with teaching and management issues.

Training and support are lacking in many districts. OTA "data on expenditures for educational technology indicate that far more resources have been allocated to hardware and software than to training or technical support."<sup>121</sup> Figures show that nation-wide, districts spend 55% of technology dollars on hardware, 30% on software and only 5% on training. While most districts have a menu of courses for teachers, this is not an adequate strategy on

its own. More successful districts have multiple and redundant options for staff learning. Many researchers advocate hiring building level computer coordinators, but these are rare positions. The number of people in non-teaching positions to coordinate teacher and student computer use remained the same between 1989 and 1992, at 6%. In one-fifth of schools in the U.S., someone is designated to work on technology issues, with at least half of the job officially defined in terms of computer coordination responsibilities. This leaves 80% of schools with less designated assistance.

Teachers need help with using equipment, understanding how to use specific software programs, troubleshooting, and working in online environments. As they personally master some aspects of technology use, they need assistance in using technology with their students. They have questions about organization, discipline, best strategies and tactics for teaching, planning and assessing learning. Some of the assistance they require is technical and can be provided by a variety of helpers, including students, parent volunteers, and student assistants. Pedagogical issues are better addressed in teacher to teacher forums, whether in groups or in individual tutoring situations. OTA and other researchers have consistently found that teachers need technical skill training, education in emerging knowledge of cognition and learning, plus visions of technology-assisted learning environments, support for experimentation and innovation, and time for learning and practice.<sup>122</sup>

### **Organizational and Attitudinal Barriers**

The culture of schools and organization of children in classrooms can be an enormous barrier to the introduction of new technologies. Most large technological changes are met with resistance to changing the parameters of "real school."<sup>123</sup> Many technologies, such as textbooks, radio, film, and television, came into schools with the hoopla and promise of radical change. The tools which have been adopted are those which are most flexible and fit most smoothly into the classroom structure, like textbooks, overhead projectors and videos for whole class viewing.<sup>124</sup>

The 1988 OTA report, Power On, described the scope of computer use in the schools and observed that "most elements of the instructional process remain the same, in contrast with other sectors of society, where technology has changed the way business is transacted, medical problems are analyzed, and products are produced."<sup>125</sup> Some technology advocates advise fixing schools with technology by adopting proper hardware and instructional design models. This argument to make schools more efficient and rational

is based on a belief in the purpose of schooling as the transfer and production of knowledge. Technology integration is seen as a straightforward process of adopting hardware, software, and proper instructional techniques.<sup>126</sup>

### **Contextual Barriers**

Others see schools in more sociological or anthropological terms, and discuss issues of socialization, acculturation, and individual development. Kerr, Cuban, and Cohen<sup>127</sup> look closely at teacher uses of technology and their ideas about teaching with computers. The researchers "argue that the teacher's world is substantially limited by powerful social and administrative pressures to teach in particular way."<sup>128</sup> The structure of learning in most classrooms, with the teacher in front of a group of students, lecturing, asking questions, keeping order, structuring movement and dialogue, is the structure assumed by most adult groups in our society when they want to impart knowledge collectively. This organization of learning is the default mode when other new strategies prove too taxing or problematic. Fitting technology into the current classroom model, whether it is the self-contained classroom of the elementary school or the sixty minute subject-centered classrooms of secondary schools, is a difficult task. Time, access, portability, and routines are all problematic. Kerr proposes looking at technology as potentially enhancing teaching and learning, acknowledging the limitations of context, and helping teachers both improve current practice as well as envision new possibilities.

### **Teaching Beliefs Affect Technology Use**

Honey and Moeller<sup>129</sup> studied a group of urban and suburban teachers to find the relationships between their beliefs and attitudes about teaching and classroom organization, and how beliefs affected their use and ideas about technology use. They found that teachers fell into four categories, one fairly homogeneous group of high-tech users and three groups of low-tech users. These categories are 1) progressive practice and successful technology integration, 2) progressive practice and technological ambivalence, 3) progressive practice and lack of opportunity, and 4) traditional practice and technological reluctance. Progressive practice is characterized in this study as student-centered, using a variety of methods such as inquiry, collaborative learning, and hands-on work. Traditional practice is seen as the lecture/recitation format, with less of a focus on the process of learning and more emphasis on student ability to pass city-wide exams. Honey and Moeller found that unless teachers are personally ambivalent or have lacked opportunity to be involved with

computers, their educational beliefs play an important role in how or whether they use computer technologies in their classrooms.

The high-tech users were mostly self-taught, and they brought computers into their classroom to support their learner-centered practice. As with the teachers studied by other researchers, this group felt that computer technologies helped them shift to a more project-oriented, small group organization, but that was the drift of their practice already. Two groups of teachers held similar views of education, but had not had the opportunity to use computers personally, or had fears about the role of technology in our society. Technology cultures had developed in their schools, but they had stayed apart. With appropriate support, the researchers felt that these teachers would integrate technology into their classrooms. Because "low tech." teachers had developed some anxiety about technology use, in order to use computers to support their progressive practice, they would need personal support for learning and visions of how technology works in classrooms. The traditional teachers either saw no use for computer technologies in their classrooms, or envisioned the use as peripheral to the main work of the class. They faced much greater barriers to technology integration, because technology integration would challenge the nature of their daily practice. Honey and Moeller recommend that schools adopt training and education strategies that recognize the very different needs of teachers, and are flexible enough to serve all. When thinking about the technology needs of teachers, it is important to think about needs for specific skill training, and to place the conversation in a broader context which considers ongoing education relating to visions of the future and teaching, and how computers can help and/or hinder the process of schooling.

### **Evaluation Tools Lag Behind**

An organizational barrier to teacher use of computers is the misfit between new ways of teaching and evaluation tools for students and teachers. Traditional standardized tests may not measure the kind of learning being promoted by innovative uses of some technologies. Also, while some teachers are anxious or excited to use electronic grading programs and programs enabling anecdotal record keeping about student learning, the programs are often difficult to use and little onsite support is provided to teachers to successfully master their use.<sup>130</sup>

## **Lack of Vision and Rationale for Technology Use**

Because computers are a multi-dimensional tool, their introduction into schools is not simply a matter of adding a better typewriter or efficient information-collecting machine. Computers have provoked a broader discussion of the purpose of schools and the future of schooling. Two types of information technologies are reshaping our workplaces and it is theorized that they will affect schools as well; smart machines and intelligent tools. Smart machines take control of a task, guiding a person through it. They act to deskill learners as the machine does the mental work. Intelligent tools enable workers to use powerful capabilities to extend their learning and production in ways chosen by the operator. Dede<sup>131</sup> argues that American schooling must alter its focus to prepare learners for cognitive partnerships with intelligent tools. He says the major focus of educational technology implementation so far has been automating marginally effective models of presentational teaching, rather than innovating, by making more effective models of learning-through-doing affordable and sustainable. The ACOT<sup>132</sup> research also found that teachers first use computers to make their current practice more efficient, and it is only with continued professional development and support that they change their practice to a more learner-center focus.

Creating new visions for the methods of learning and the roles of teachers and students in the classrooms is a complex task and it challenges the current practices and the professional career investments of teachers. Teachers with regular access to computers over several years have radically changed their instruction, and their beliefs about teaching and schooling, but the changes do not come about with the simple introduction of hardware and software. Many advocates believe that computer technologies have the potential to vastly transform the relationships between teachers and student, including how and where they go to school. Simply introducing a tool to a teacher does not produce change in most classrooms. Most advocates of technology in schools acknowledge that effective use results from a long process of learning and experimentation, with the support of technical and pedagogical assistants, eventually producing transformed learning environments.<sup>133</sup>

## **Various Teacher Concerns**

In 1987, Stecher and Solorzamo<sup>134</sup> described teacher concerns about computers: a fear of uncertainty, concerns regarding changes in teacher/student relationships, and concerns about accountability. Although technology has changed greatly in the last eight

years, teachers still report having the same kinds of concerns. Teachers report that they prefer learning about technology from other teachers or those who understand the limitations and the constraints of the settings in which they work.

Beginning computer-using teachers wonder how they will fit student computer-use into their classroom routines. They tend to treat computer use as a separate activity from other learning experiences and routines. In the classrooms of exemplary computer-using teachers, "students' use of computers is woven integrally into the patterns of learning and instruction through which the curriculum is given meaning."<sup>135</sup> Computers are used as vehicles of communication and analysis and their use is not separate from other activities. Getting from one viewpoint to the other requires well-thought out staff development options.

While there is a popular perception that several personal characteristics affect teacher attitudes and use of computers, research findings are mixed. Some studies show male teachers to be more positive towards computers than females, but most do not show this difference. Many of the gender difference studies have focused on attitudes about computers and there is some debate as to whether attitude predicts behavior, and whether the studies themselves emphasized male terms and language. Research at the Bank Street College's Women and Technology Project showed that women and men see computers differently, with men tending to see a computer as a "machine that extends their power" and being excited about the computer itself, and women seeing the computer more relationally, looking for ways to use it to relate to other people. Given adequate opportunities and resources, teacher learning and adoption of technologies in classrooms does not seem to be limited by factors such as age, gender, anxiety, or previous experience with computers.<sup>136</sup>

Teachers voice other concerns with integrating technology use into their daily practice, including a discomfort with changing roles of students and teachers when students become expert; accountability issues (including curriculum coverage, student learning measures); privacy concerns about what is public and private and who has access to what; copyright and intellectual property questions; and worries about student access to offensive information versus censorship issues. All teachers face a range of barriers to improving student learning opportunities with technology. School districts try a number of ideas for meeting the training, resource and support needs of teachers.<sup>137</sup>

### **Meeting the Training, Resource, and Support Needs of Teachers**

Jane David<sup>138</sup> studied a number of schools in the ACOT project and suggested four critical elements which must be in place for schools to change significantly in the direction of ACOT classrooms; an invitation to change, the authority and flexibility to do things differently, access to knowledge, and time. In addition to the support ACOT teachers provided each other, they were also supported by training workshops, technical support, release time for conferences, extra time for joint planning and team teaching, a telecommunications network that allowed interaction across sites and with project staff, and the opportunity for routine peer observations and group discussions.

The Office of Technology Assessment recently completed a nationwide study focusing on teachers and technology, finding that most effective strategies make significant investments in providing ready access to hardware and software, appropriate and timely training, expertise to support and help teachers, and time for teachers to learn, and work with technologies and colleagues.<sup>139</sup> A critical issue is how to scale up the successful experiments that are found across the country.

### **Varied and Redundant Instructional Plans**

In the beginning of mass entry of computers into schools, it was recognized that teachers required a variety of kinds of instruction. Carrier, Glenn, and Sales<sup>140</sup> described the need to provide differently structured courses for novices and for experienced users. Technology itself is constantly changing, and staff turnover and teacher growth insure that teachers and their needs continually change.<sup>141</sup> The needs of teachers differ at various stages of their personal development and therefore a school district needs to provide continuous introductory and more sophisticated training.

Stecher and Solorzamo<sup>142</sup> described elements they believe should be a part of every formal learning opportunity. These include:

- \*extensive practice with computers
- \*comfortable and relaxed atmosphere
- \*appropriate balance between lecture and guided practice
- \*individualized attention
- \*knowledgeable trainers
- \*detailed curriculum guides and lesson plans
- \*clear and relevant objectives

- \*lesson-related materials and handouts
- \*in-service lessons linked to instruction
- \*peer interaction
- \*voluntary participation
- \*strategies for teaching heterogeneous classes

Other researchers describe similar characteristics of successful technology inservice. Additionally, the kind of training is as important as the availability. If training is always focused on tool mechanics and not on integrating technology into various subjects or learning to use it as a pedagogical tool, then computers will be rarely used for instruction. Districts which have been successful use varied and redundant plans for training, realizing that teachers have different needs over time and that district staff turnover requires continual offerings of all levels of courses. Districts try to offer as many opportunities as are possible at each school site. Courses that are very subject-specific, or targeted at job-alike or small groups of learners, are offered at district or regional centers. A good staff development program will have opportunities for experimentation and self-instruction, and also for workshops and watching experienced teachers. A menu of course opportunities is part of a strategy which includes a variety of resources and supports.<sup>143</sup>

### **Plans for Ongoing Education and Support**

If school districts desire instructional change, what should be provided to teachers so they can learn and make changes? Most researchers agree that staff development related to computers should be part of ongoing professional development opportunities. In 1988, OTA recommended that "additional incentives could be developed to encourage teachers to stretch beyond their current levels of expertise or to encourage technologically experienced teachers to train their colleagues and provide support for them."<sup>144</sup> Some of the incentives suggested for extending the teacher-to teacher connection were grants, additional pay, release time, summer work, paid participation in conferences, increased status as lead teachers, sabbaticals, and a computer for use at home or school.

The 1995 OTA<sup>145</sup> report describes successful approaches in place in some locations to implement computer technologies, including a "train the trainers" model, provision of an onsite expert, deliberately distributing expertise, giving every teacher a computer, training school and district administrators, and establishing technology resource centers. All of these strategies "make significant investments in three elements of teacher support:

appropriate and timely training; expertise to support and help teachers; and time for teachers to learn, "mess around" with technology, and work with colleagues."

### **Train the Trainers**

"Train the Trainers" is a strategy in use in many districts for technology implementation as well as for other curricular adoptions. Selected motivated teachers are given training and return to their buildings to inservice their colleagues. Teacher-trainers help their fellow teachers one-on-one, and in courses or workshops offered after school or during release time. They are continually available in the building when they are needed for follow-up assistance. Some researchers found that it is better to have more than one trainer in each building, so that the trainers can help and support each other, and encourage others over time. A critical success factor with "train the trainer" models is continuing training and support for the trainers, plus time and administrative support. Research suggests that personal characteristics that affect the success of trainers include interpersonal and organizational skills, as well as technical skills.

The provision of appropriate and continuing support is a puzzle several districts have addressed. Some provide temporary onsite support from vendors or district personnel and others find ways to fund continuing support at the building or district level. While districts assume that temporary support people will work themselves out of jobs, this does not often happen. Once teachers are supported in their learning, demand for support increases over time as they attempt more and more uses of technology.<sup>146</sup>

### **District Technology Support Staff**

Some districts designate district technology support staff. Jefferson County schools in Kentucky exemplify this model. The Computer Education Support Unit of 22 people supports 5000 teachers with technology training and support. They run a help line and have designed independent inservice units on computer topics which staff can use to learn on their own. They run inservice workshops in a central location and work with staff at individual sites. Some of the computer staff are teachers who are hired to go out into buildings and support teachers directly.<sup>147</sup>

### **Model Programs**

Model technology schools and classrooms are established in some districts to allow enthusiastic teachers to innovate and to provide implementation models and training opportunities for others in the district. Technology-rich environments are created

deliberately to function as living laboratories about learning and teaching with technology. In some cases, dissemination of training and effective models are mandated as part of the contract for establishment and maintenance of the model programs.<sup>148</sup>

### **Give Teachers Computers**

Some schools and districts give every teacher a computer, for school or for home. The rationale is that teachers will not use computers to teach until they are comfortable users of them as personal and professional productivity tools. Districts figure that access on demand is critical, and so provide computers for teachers. Some districts tie the computers to required training. The provision of computers can be a leverage point for districts to require a common set of training opportunities or competency checks.<sup>149</sup>

### **Administrator Support Important**

Research on the adoption of innovations includes the key role of administrators. Principals, superintendents and other administrative personnel are vital to the successful implementation of school computer use. OTA found that administrators who are comfortable with computer technologies and informed about their uses play key roles in leading and supporting technology integration. To this end, districts target administrators for training and ongoing support. Leaders perform four important tasks: a) obtaining resources, b) buffering the project from outside interference, c) encouraging staff, and d) adapting standard operating procedures to the project.<sup>150</sup>

### **Technology Resource Centers**

States and school districts have established technology resource centers in an effort to concentrate resources and offer training and experimentation sites for teachers. Model classrooms can fulfill this role, but other centers more closely resemble traditional Teacher Centers. In Lake Charles, Louisiana, the Calcasieu Parish Schools established a district Tech Center that offers training, hosts teleconferences made possible by satellite dish, and provides online access to a library of periodicals and other resources. It is open days, evenings and weekends for staff use. Texas provides regional support centers that function as training sites, preview centers, and support services.<sup>151</sup>

### **"Super Subs" Program Addresses Difficult Issue of Time**

Even when districts provide training opportunities to teachers, the problem of time is critical. The Monterey Model Technology Schools in California developed a program called

Super Subs to address teacher concerns about leaving their classrooms for training, and the effort involved in writing lesson plans and worrying about time lost with their classes. In California, teachers and administrators who take early retirement are required to contribute hours to the district. The Super Sub program trains these people in technology use and provides lessons in critical thinking skill development. Super Subs offer generic lessons in classrooms while the classroom teachers are released for training. The same Super Sub returns several times a year, provides lessons consistent with the district curriculum, communicates with the classroom teacher, and provides the opportunity for the teacher to concentrate on improving personal and professional technology skills.<sup>152</sup>

### **Onsite Training and Follow-up a Puzzle**

Increasingly, districts struggle to provide on-site training and follow-up. It is acknowledged by most researchers and practitioners that training, follow-up support and coaching are essential to effective staff development. Some schools structure training so that it takes place over a long period of time, to accommodate individual learning and practice time. Others provide electronic support networks to link participants with instructors and other helpers. Ongoing support is a major unsolved puzzle for most districts.

Many districts have built programs on the labor of eager, enthusiastic, hard-working pioneers and innovators. As time goes on, these people move out of the district or burn out if they are not well-supported and districts do not develop multiple ways to encourage and support teachers in technology use. Successful districts figure out how to spread the expertise among many individuals and groups. Students are developed as a resource in many districts.<sup>153</sup>

### **Support for Experimentation and Innovation**

A problem faced by many school districts is the tension in implementation plans between support for innovation or equity. It is widely held by technology experts that a little technology equally spread through every classroom in a district leads to widespread mediocrity and little positive benefit for students. On the other hand, concentrating technology in a few sites or with a small number of teachers, leads to cries of protest from parents and students not directly benefited.<sup>154</sup>

Technology-intensive centers function as models for technology use when a technology innovation is young. In the beginning of computer introduction to schools,

many teachers support the concentration of technology in labs or in the classrooms of computer enthusiasts because they are unsure of their own skills in technology use and management. Districts often fund model classrooms as a way of exploring uses of technology and supporting early users. They hope a snowball effect will occur and that enthusiasm and attention focused on the model classroom will spread to other classrooms. Model classrooms are also a way to give early adopters a role in technology implementation in the schools.<sup>155</sup>

As districts mature in their technology implementation, they struggle with how to continually support experimentation and innovation, while extending opportunities to all learners and teachers. Pioneer teachers are employed as teachers of their peers or featured in model classrooms, via classroom visits or videotaped model lessons. They are supported with grants in demonstrating new or deeper uses of computer technologies for learning.

Policies that encourage teacher experimentation and collaboration are important for districts to go ahead with technology implementation. Collaboration and collegiality are important factors cited by researchers in the success of accomplished computer-using teachers. ACOT researchers found that teachers' learning is helped and hastened when it occurs in a context of high collegial interaction, and that "structural and programmatic shifts in the context or working environment of teachers who are learning to use innovative technology are critical."<sup>156</sup>

After studying teachers learn, Dwyer came to believe that "Instructional change can only proceed with a corresponding change in beliefs about instruction and learning. Teachers' beliefs can only be modified while they are in the thick of change, taking risks and facing uncertainty. Teachers bold enough to participate in these efforts require and deserve modifications in their organizations' structure: alterations that permit and encourage peer observation, dialogue, and reflection. Most importantly, they must have a way to gain continued assurance that their struggles are worthwhile."<sup>157</sup> ACOT projects provided teachers with time to learn alone and together, multiple opportunities to ask questions of technical and pedagogical support staff, opportunities to share in person and over electronic networks, and recognition of their efforts. Most districts struggle to provide these supports.

### **Time for Learning and Practice**

The issue of teacher learning is not only a school issue. Glenn and Carrier explain that "the inservice of teachers, especially in the broad contexts of instructional and learning strategies and visions of technology use in the future, needs to be supported by a larger

community involving higher education, state departments of education and federal initiatives."<sup>158</sup> The support needed by teachers pivots on the important issue of providing time to learn in the context and economies of public schools.<sup>159</sup>

Learning to use and teach with computers takes time. Computer-using teachers report that, at least initially, most uses of computers make teaching more challenging. Bellevue School District in Washington concentrates computer technologies in computer intensive classrooms. A study of the teachers chosen for these classrooms, in addition to teachers in two nearby districts, confirms that they express many of the same opinions as the teachers studied by Sheingold and Hadley. The researcher asked what was needed for successful integration of computers into schools. Kerr concluded that "Time to learn what technology is for, and to develop a way to integrate it into a personal teaching style was a critical requirement."<sup>160</sup> These teachers recommend going slowly in introducing technology and instructional changes. Given time and support, teachers altered their beliefs and their classrooms. Kerr suggests that "the fulcrum of technology may in fact be providing a point around which classrooms can be restructured to feature the teacher, perhaps in a more complex and more demanding role than before, as organized, encourager, director of and participant in classroom activities."

Time is a critical issue in most change initiatives, including teacher learning and practice with computers. Ongoing professional development is not usually a part of the teaching profession. It is, however, necessary if teachers are supposed to learn new skills and teach in new ways. Studies of technology implementation suggest that teachers require 3-5 years to become sufficiently comfortable with technology to incorporate it into their regular repertoire. Reports of technology implementation in school districts chronicle the difference in anticipated and real time and effort required.<sup>161</sup>

### **Ready Access to Hardware and Software**

Teachers all suggest that they need access to adequate resources in order to learn to use computers. Adequate resources are a matter of scale. For computers to begin to effect the organization of schools as they have in workplaces around the world, they have to be powerful and multiple. Teachers cannot learn to use and teach with computers if access is limited and prospects for acquiring equipment and repairs are slim. An infrastructure supporting use, training and repair of computers has developed in the industrial world, in which staff training is part of the institutional context. This is virtually absent in schools.

OTA calls for a new way of defining access that examines the kinds of infrastructure, organizational arrangements, and other supports teachers need to use technology effectively in the classroom.<sup>162</sup> Current methods simply count pieces of technology and give ratios of computers to students as indicators of the increase of computers in schools. A new definition would consider amount of equipment, but also look at infrastructure in a broader way, and count type of technology, age, capacity, connectivity, software, and services. Organizational arrangements, placement, and flexibility of technology affect its use. A new definition of access would include the kinds of support offered to teachers, exposure to innovative uses, flexible just-in-time training, and ongoing technical support and expert advice and access to necessary information. To be considered accessible, technology should be available to teachers when they need it and not on some fixed schedule or rotation. It needs to be up to date and kept in working condition. Schools need to rethink the way they budget for technology and include ongoing budget support for upgrades, repair, supplies, training and support. Given current trends, connectivity is the big issue of the next several years.<sup>163</sup>

### **Summary**

Several writers make the case that effective use of computer technologies could be a catalyst for school restructuring and the creation of active learning environments for children. They believe real change will come only with significantly altered practice in each classroom or learning situation, and that teachers are the crucial link. After studying the technology needs of teachers, Sheingold concluded: "We begin with the assumption that how teachers are educated with respect to the new educational technologies will prove to be critical in shaping education in the next ten years. Teachers should be central participants in and builders of the future of technology in education, not solely the recipients of decisions made by others, either in the area of training or in tool design. Specifically, they should be supported and encouraged to adapt computers to their own and their students' purposes, to explore the ways in which technologies can alter what happens in the classroom, and to share what they do and what works with other teachers. Teacher development programs must support teachers to shape and engage in experiments with technology, experiments that can inform and influence the future of technology in education."<sup>164</sup> Most researchers and practitioners believe that helping teachers may be the most important step to helping students. OTA says that the critical issues are ready access, instructional vision, and sustainability. This is consistent with the findings of others.<sup>165</sup>

Effective technology implementation takes more time and effort than many anticipate when first undertaking technology initiatives. Five years is the time frame for large scale technology infusion recommended by OTA. This seems overly optimistic if the goal is technology integration in every classroom. All pioneering school districts experienced the course of technology implementation as complex and bumpy, with changes continually necessary. The process of writing technology plans functioned to surface and focus concerns as much as to chart a course for the future. A key issue continues to be how to learn from the efforts of pioneering districts and make opportunities possible with technology available to teachers and students in all school districts.<sup>166</sup>

### **Consistent Patterns and Gaps in the Literature**

In reviewing the literatures concerning professional development, teacher leadership, and teachers and technology implementation, there are a number of consistent findings and speculations, as well as areas which need more research.

There is a constant refrain that teacher learning is the key to change in schools. New curricula are implemented and new methods successfully adopted when teachers are provided with training, ongoing support, access to adequate resources, time to learn and practice, and an environment which is collegial and focused on student learning. Teachers consistently report that they are motivated by increased student learning, that they are willing to invest time if they feel that it pays off in the classroom, and that they like to learn from and with other teachers.

Teachers, like most adults, learn throughout their lives, across settings and circumstances, in formal, collective learning activities planned by others and from informal, self-initiated, and self-directed activities. They come to learning experiences with the accumulated knowledge, skills, and beliefs of their lives, and each new learning is shaped by the past. Many researchers have come to view teaching as a complex, dynamic, interactive and intellectual activity, but it is unfortunately viewed by many citizens as not very difficult or complicated. While our society continues to demand more and more of schools, there has been almost no corresponding investment in training and professional development. Observers of schools recommend that schools offer a varied menu of formal and informal learning opportunities for teachers, with special attention to the "five-minute inservice" or "at the teacher's elbow" access to continued support, advice, examples, and direction.

Joyce has observed that "the quality of schooling and the work lives of educators are inextricably entwined."<sup>167</sup> As continuing efforts to improve schools progress, a host of researchers look at what teachers do and how they learn. If goals for implementation consist of specific, discreet sets of skills or models of teaching, there is research evidence to suggest important factors in training and follow-up. If more broad or complex goals are the target, there is less evidence of what works, although there is no shortage of recommendations. Educational change depends on what teachers do and think and professional development is a system of supporting individual and institutional learning.

Districts are purchasing computers now and they are trying various strategies to inservice their staffs, including the use of lead teachers, course offerings, after school training sessions and other strategies. Staff development strategies are used alone or in combination, according to the resources and attention brought to the situation.

Schools today face multiple challenges, and some attention is paid to the lessons learned from research. Schools are bringing computer technologies in and are struggling to support their best use. The amount of money allocated to schools is holding steady or going down. It is not likely that there will be massive infusions of new money into schools to support the status quo and provide new equipment, training opportunities, and ongoing resource and human support. Schools are scrambling to work within their means and harness what they view as the great potential of computer technologies. Many of the exemplary uses of computer technologies reviewed here have resulted from enriched experiments. As schools look for ways to scale these effects more broadly, they try to leverage their investments. Most researchers recommend that school districts use a variety of strategies to help students and staff learn with computer technologies. Continued and detailed examination of staff development and support strategies is needed to see what is effective and sustainable.

Teachers are the targets of the staff development initiatives, but they are also the agents of change who will bring the new learning and teaching into the classroom. If districts want innovation to get past the classroom door, it is important to know how teachers operate in various roles and to understand what effects their learning and teaching. Between the visions of completely well-resourced, restructured learning organizations and ineffective, one-shot inservice sessions, are modest proposals and small workable solutions. Examination of current efforts will produce explanations and images of possibilities.

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## **Chapter 3**

### **Study Description, Rationale and Context**

#### **Introduction**

Chapter 3 begins with an introduction to the study, and follows with contextual descriptions of the school district and technology programs underway, including the Seed Teacher program and the Technology Effectiveness and Knowledge (TEK) Initiative. Following the preliminary explanations of the Seed and TEK programs, the evolution of the Seed Teacher program is detailed, the provisions of the current Seed Teacher contract listed, and the resources available to Seed Teachers described. After considering the context, a rationale is presented for studying lead technology teachers. A description of the study includes the conceptual framework which guides the study as well as the research questions. The chapter concludes with summary comments about the use of technology lead teachers as a strategy for teacher learning and support.

#### **Ongoing Training and Support to Teachers**

A common denominator in the studies of professional development, teacher leadership, and implementing computer technologies into K-12 schools is the need for initial training, and ongoing support and assistance to teachers as they learn to adopt new tools and teach in different ways.<sup>1</sup> While computer advocates have different visions of learning and teaching, all acknowledge that teacher learning and support are critical.<sup>2</sup> Schools have limited funds, so they seek cost-effective ways to train and support teachers on an on-going basis. Some districts search for the "one best way," but others look for combinations of staff development strategies which can be employed to implement computer technologies in classrooms. Researchers advocate programs which feature lead teachers, provide ongoing support to teachers in schools, provide opportunities for teachers to work together, and encourage all to take a stance as learners. Many believe programs should represent a long-term investment in building the capacity of individuals and schools to learn and teach differently.<sup>3</sup>

## **Context for the Study**

### **Vista School District**

Vista School District serves a rapidly growing rural/suburban area in the Pacific Northwest. In the year of the study, the school district employed approximately 1,000 full- and part-time employees and served 9,200 students in two mainstream high schools, one alternative high school, one correctional institution, two middle schools and ten elementary schools. A new middle school opened the year after the study and new elementary and high schools are being built.

The school district, like many others, is involved in various restructuring initiatives. It is responding to reform initiatives and legislation demanding change. During the study, the district was in the fourth year of a six-year grant project, funded in part by a statewide coalition, to examine, "radically change", and significantly improve its schools. In 1990, the district published a "Student for the Future" document which provides the framework for curriculum decisions, and defines district goals in relation to this framework.<sup>4</sup> District personnel and parents are examining use of time, development of core competencies, curriculum redesign, age realignment and site-based decision-making. These change initiatives are in addition to the daily business of educating children and youth.

Vista School District includes the town of Cascadia and the surrounding area. Until recently, it was a rural, quiet community on the outskirts of a metropolitan area. It is now experiencing dramatic growth and becoming increasingly suburban. Within the geographically large Vista School District are three phone companies, two cable television companies, and addresses of three different cities. Cascadia is the center and primary focus of the district. Most of the new growth is in the east part of the district, with the center and west areas holding steady. Therefore, the new buildings are all in the east section of the district, and there are concerns for equity as the west-side schools become older and more rundown. Six of the older elementaries are scheduled for remodeling in the 1995-96 school year, including the three in this study, so teachers have been meeting for two years to think about their schools and how they might change them in the remodeling process.

### **Technology in the District**

Vista School District is now engaged in several technology projects. In the early 1980's however, the district experienced the same uncoordinated growth and

experimentation with hardware and software as did many other school districts. Several needs emerged from the problems generated in the early years, including staff and student training, and issues of connectivity and maintenance. These needs have been addressed through various programs.

For the past twelve years, Vista has invested in a teacher leadership model aimed at computer implementation support, the Seed Teacher program. The district chose this strategy deliberately. The superintendent hired a consulting firm in 1984 to examine technology infusion into schools and report on staff development options. The consultants did research, examined neighboring districts, and produced a report listing several possibilities. Former Superintendent Sara Brand reported choosing a developmental model. She and district leaders believed that before students could become comfortable learners with computers, teachers must do so. They wanted to invest in a plan which focused on teachers and their learning.

### **Overview of Seed Teacher Program**

In response to the staff development study and the simultaneous work of a district elementary school computer committee, the Seed Teacher program was started in the 1984-85 school year. Volunteer teachers in elementary schools received a stipend and some training in exchange for taking a leadership role in their buildings. Consultants were hired to teach basic computer skills in each building and the Seed Teachers assisted with the coordination of this training and in the actual instruction. In the early years, there were few computers in the schools, and these were mostly inexpensive Commodores.

The early Seed Teachers signed contracts with specific duties and time commitments assigned. Besides trouble-shooting and providing individual assistance, a big part of their job was to do model teaching with groups of students, demonstrating the uses of various kinds of software. One founding Seed Teacher recalls that the "Seed" metaphor was chosen to describe the growth idea in the new program. The founders wanted to help some teachers grow, then help some more, then help some more. They envisioned a time when most of the staff would be or would have been Seed Teachers. They also hoped that knowledge and excitement about computers would spread to other teachers in a blackberry-like fashion. The Assistant Superintendent said that the district hoped to use the Seed Teacher model to introduce other new methods or ideas into the schools. Its essence was teacher learning, teacher leadership, and teacher-to-teacher help.

As the years passed, the program became both more centrally formalized and more responsive to the needs and interests of those working in each school building. There are

now two Seed Teachers per elementary school. Each serves a two-year term, agreeing to offer care and maintenance sessions for building staff who use computers. They provide troubleshooting advice and assistance as needed, and offer model teaching lessons, inservice classes, staff meeting presentations, or other computer-related services for teachers. Their plan and schedule for service is determined at the building and approved by the principal. The Seed Teachers receive two release days, which they may schedule as needed to accomplish these duties.

Seed Teachers are required to attend four half-day district Seed Teacher meetings interspersed throughout the school year. They must take two classes, one offered through the district (with the district covering the cost), and one chosen in or out of the district, at the Seed Teacher's expense. For each year of service, Seed Teachers receive a stipend ( it is \$1375.00 for the 1993-94 school year). In lieu of this stipend, they may choose to receive a Macintosh or DOS computer for their home. Seed Teachers attend a regional computer conference, with registration and one day release covered by the district. Principals are asked to cover the second release day required for full conference participation and Seed Teachers usually pay for lodging and meals.

The Seed Teacher program operated only at the elementary level until 1990-91 when the program expanded. There are currently two Seeds in each elementary and one in each middle and high school. When the program expanded to the secondary schools and new elementary schools, the funding sources did not increase in a corresponding way. The program is funded with federal Chapter II dollars and with local district money. The contract is flexible, allowing each building to decide how to best use the Seed Teacher's time. From the beginning of the program to the present, the emphasis has been on the personal learning of each Seed Teacher and on the help they provide to their peers. They are to serve as models and inspiration to other teachers in improving their learning and teaching with computers.

### **Technology Effectiveness and Knowledge (TEK) Initiative**

The TEK Initiative was created in the fall of 1989. It is described in the latest district brochure as being the brainchild of a local parent who specializes in creating integrated computer and phone networks for major corporations. He convinced the district of the need for the incorporation of technology into a district-wide plan. It was his idea to involve high school students as leaders and workers in the development and implementation of the plan.

The brochure on the TEK Initiative lists these goals for the project, "to create an electronic village for learning by:

- \*providing computer workstations for every teacher;**
- \* insuring computer access for every student, kindergarten through twelfth grade;**
- \*creating local and wide area networks that link every TI machine in the district and facilitating electronic collaboration;**
- \*upgrading district communication systems to provide access between schools, students and parents and international learning networks, and**
- \*utilizing the human resources of students, staff and volunteers to develop and oversee the project."**<sup>5</sup>

Between 1991 and 1992, all certificated staff received computer workstations, their choice of a Macintosh LC or 486 DOS computer. The computers have been gradually connected into local and wide area networks. High school students have been the workers who designed and implemented the system. A team of students are assigned to each school and are responsible for maintaining the network. Seed Teachers work with the students in each building. The networking has been a slow and irregular process, involving many technical, scheduling, and budgetary problems. Using funds from a Technology Levy, schools are in a six-year cycle of purchasing computer workstations for students. The levy brochure projected that the goal was 3-4 computers per classroom by the end of the levy period (1997). Technology in the district is under the umbrella of the TEK Initiative, run by the Information Systems Manager, Wes Wright; the Technology Team Leader, Joanie Land; and the TEK Lead Team; a loosely-organized policy-making group which meets two times a month.

Staff training has been irregular. In some buildings, the computer vendors provided initial training in 1991 and 1992. Seed Teachers and other teachers have offered building and district inservice courses. Seed Teachers have been on call to help teachers learn to hook up and use their computers and printers. Demands on Seed Teachers increased tremendously when every teacher received a computer. Demands increased again as each building was brought onto the network. Seed Teachers have been uncertain about the scope of their responsibilities and duties. In 1993-94, the program was placed in the control of the Director of Curriculum and Staff Development, Betty Tucker. The hope is that this will allow Seed Teachers to focus on curriculum issues involving technology.

The district and the TEK Initiative have received media attention (local press, Microsoft newsletter, Forbes Magazine, state education newsletter, New Horizons for Learning newsletter, others). The parent, Kirk Harrison, who started and continues to be involved in the program has been instrumental in starting a statewide network, WEDNET, and is helping other states do similar programs to the one he started in Vista School District.

Most attention is focused on the use of students to build and maintain the network. In 1992-93, students who regularly used the Internet for their own assignments and to gather information for their teachers, were the focus of press reports and conference presentations. Teachers reacted in a variety of ways to the activities of the students. Some have been energized and propelled forward and others have felt left behind. District attention to teacher training has been spotty. The TEK Initiative took as its first task the mechanical job of getting the computers operational and getting the networks to work. The hardware and wiring are funded from bond and levy money. This pot of money cannot be used for staff training, and there have been few budget dollars allocated for this purpose. Without the money to pay instructors or provide for release time, little energy has been spent on the issue of ongoing staff training.

District hopes for ongoing staff inservice ride on the Seed Teacher program. It is hoped that the focused energy of two teacher leader/helpers will meet most of the needs of teachers for in-building help. A limited number of courses are offered through the staff development program of the district. With the Seed Teacher program in its tenth year in 1993-1994, it was also hoped that there was a cumulative expertise building up in each building.

### **Seed Teacher Program: Evolution and Current Expectations and Resources**

#### Evolution of the Seed Teacher Program from 1983 to the Present

Ned, a founding Seed Teacher and one of the seven interviewed for this study, relates the evolution of Seed Teachers over the years. He says the initial problem was how to train teachers with very limited resources. In the first years, there was a small stipend and "phenomenal expectations." The first Seed Teachers were to work with the newly purchased Commodore computers in the buildings, to troubleshoot, do minor maintenance, train colleagues in word processing and be a resource in their buildings. "The idea has always been to rotate people through the program." The name "Seed Teacher" came from what he described as a "60's idea" of planting and nourishing a seed so it will grow and bloom, and continuing until a whole garden of flowers was in bloom.

Ned described the early days of computer introduction to the district as exciting and hectic. "There was such a strong interest and drive to get things going. The parent community was howling, 'When are computers going to come into the District?' A handful

of people really got caught up in what was going on." The computer committee met regularly, argued issues and shared research. The Seed Teacher program grew from the need to get training to the buildings. The committee's thinking was "We have limited resources. We can't train everybody. We can't run District-wide word processing classes. And this is all we can get money for and approval for. So ...90% of necessity." The Seed Teachers comprised the district computer committee for the elementary level.

Superintendent Sara Brand added to these recollections. "In the early 80's, we were beginning to think, now how are we going to infuse technology, primarily computers, into the classroom. We looked at all of the various inservice models that were being used. We contracted with a couple of consultants to provide for us a little booklet that described all of the different ways that school districts were approaching this matter of infusing technology." The leading models were providing computers to teachers in exchange for summer training, contracting with universities for series of courses, and paying teachers to take courses in exchange for teaching obligations upon completion. She believed that these ideas had some merit, but was concerned about how to develop ongoing inservice, and how to inservice the whole staff. She did not want to develop a small group of technology users and a large group of technology non-users.

"The thing that really drove us, was right at the same time, we were working with the Puget Sound Educational Consortium. Ann Lieberman was there, and she was espousing this idea of teacher leaders. We said, let's give teachers an opportunity to provide leadership. So that's how the idea was born." Sara Brand assigned Katherine Larson as the administrator to develop the Seed Teacher program. Larson was the district administrator for K-8 schools, and also became the director of the TEK Initiative in 1990, and became the link between curriculum and technical people. She led many initiatives related to curriculum reform and restructuring. In Brand's view, "the bottom line was to get computers and computer training into the hands of teachers so that they would in turn use them to open up new avenues for kids."

Betty Tucker, a former principal who is now the Curriculum and Staff Development Director, remembers that the computer committee wanted to hire a district computer coordinator. When the funding was not available, the committee came up with the idea of Seed Teachers in each school. Whatever its actual origins, the Seed Teacher program survived through budget cuts, threats to federal funding, expansion to the secondary schools, and the deaths of administrators and Seed Teacher program champions, Katherine Larson and Sara Brand. Joanie Land was secretary to Larson through most of the developing years of the program and she emerged as a key figure in technology

development in Vista School District. In 1991-92, she assumed the position of Technology Team Leader, a position created for her which expanded her previous duties. By default, she picked up direct, although not official, responsibility for the Seed Teachers. A structure and tradition had been created for the program, and it continued to function through inertia, and with the nurturing attention of Joanie Land. In the 1993-1994 school year, official responsibility for the program shifted from Joanie's supervisor, the Technology Director, to the Director of Curriculum and Staff Development, Betty Tucker. Over the years, as computers multiplied and difficulties multiplied, Seed Teachers had been more and more consumed with trouble-shooting duties. With the transfer of supervision from the Technology Director to the Curriculum Director, it was hoped that Seed Teachers would shift focus from technical help in schools to curriculum-focused work and leadership. No resources were attached to this proposed shift in focus so it did not happen.

#### 1993-94 Seed Teacher Contract

Seed Teachers sign a contract each year which lists their compensations and obligations. This is the only document they receive about the duties and expectations of the role. For the 1993-1994 school year, the contract read as follows:

"Seed teachers for the 1993/94 school year will receive a contract valued at \$1375.00. They may choose a computer in lieu of the stipend. The computer option this year will be a Mac LC II or III or a DOS 486SX25, with operating software only. Some of these options will require a supplemental check as their purchase price is above the seed teacher contract allowance.

Tasks for which seed teachers will receive compensation (either stipend or computer) are as follows:

1. Schedule and offer care and maintenance sessions for building staff who wish to use computers. Staff members will be asked to work through a checklist on care and maintenance procedures with seed teachers in their building.
2. Schedule and offer either model teaching lessons, working with teachers on curriculum topics, mini-presentations to staff, inservice offerings, software demonstrations or other instructional assistance to fellow staff members, using the two seed teacher release days. These designated days may not be used to attend conferences. With principal consent, though, a seed teacher may take one of the two days as a release day with seven and one-half hours documented for teaching after-school inservices (which begin after WAC time).
3. Provide troubleshooting advice and assistance for fellow staff members as needed.

In addition, seed teachers are expected to meet the following requirements:

1. Attend four half-day seed teacher meetings interspersed throughout the school year while school is in session. (Release time will be provided by the district.)
2. Take two classes. The first class will be chosen from in-district technology offerings. The district will cover \$40 registration. The second class will be a choice option, in- or out-of-district at own expense. Classes taken during the summer of 1993 may be counted.
3. Attend the Northwest Computer Conference in April 1994 in Spokane. (Registration and one day release time to be provided by the district. Principals will be asked to provide a second day of release time. Transportation and hotel accommodations cannot be covered by the Seed Teacher Program.)

Minimum length of service in a seed teacher position is two years. The seed teacher will have the option to receive a computer each year and be encouraged to place the second computer in his/her classroom during the term of service. District insurance will not, however, cover a personal computer in the classroom. (Vista School District, June 1993)."

Seed Teachers sign this contract twice, as they accept responsibility for the job in the spring before their term, and again at the end of the year. Annually, they file a Responsibility Checklist with the Technology Team Leader, Joanie Land, listing when they conducted care and maintenance sessions, when and how they used their release time, what classes they took, and their comments on participating in the Northwest Computer Conference.

When the Seed Teachers come to the first Seed Teacher meeting of the year, they are given a notebook containing all forms they need for ordering equipment and software, inservicing staff, and for getting repair services into their buildings. The notebook also has a roster of current seed teachers, numbers to call for help with various problems, mock purchase orders for hardware and software they are likely to need, information about the electronic mail system, and the Technology Ethics policy for the district. Seed Teachers are expected to add to this notebook as their term progresses. The notebook now contains practical, resource-based materials. Absent are the research articles and inspirational tales of school technology use which were a constant feature of the early technology meetings in Vista Schools under the leadership of Katherine Larson and Sara Brand. Sharing articles and findings had been a mainstay of the work done by teachers collectively, but this feature had disappeared by 1993-94. The focus of Seed Teacher meetings is linking of resources, training activities, and updates on district technology information.

### Resources Available to Seed Teachers

Seed Teachers are supported in their job by several people and systems. It is expected by the technology leaders that expertise is building up in the schools over time and that former Seed Teachers are helping current ones. District technology technician, Frank Barrett, is available every morning on the phone and can be summoned to a school when necessary. Technology Team Leader, Joanie Land, is the main contact for Seed Teachers, working with them on their personal contracts and computer purchases, and informally monitoring their work as Seed Teachers. In 1993-1994, Betty Tucker, Curriculum and Staff Development Director, was beginning to take control of the program, but she did not support the Seed Teachers in a direct way. Technology Director, Wes Wright, seems a formidable figure to some Seed Teachers, but is sometimes available for help or direction.

One or two high school TEK students are assigned to each school to make the local area networks operational and to maintain them. They report to the Seed Teachers. Relationships differ from building to building. In some cases, these students teach the Seed Teachers how to do basic trouble-shooting on hardware problems as well as network issues. Teachers Bob Donaldson and Todd Everett supervise the students and are available to the Seed Teachers for consultation. In addition, Todd Everett, was hired half-time as an Instructional Technology Specialist to support teacher learning district-wide. In this capacity, he assisted teachers at all three of the schools in this study. Plains High School was the site of a Help Line, but it was not as consistently helpful as planned. While this description sounds like there is plenty of help available to Seed Teachers, most of them could not have articulated this whole list. All of the teachers in the study wanted more help in more timely ways. They often felt stranded and overwhelmed with problems. Joanie, the Technology Team Leader was the glue that kept the Seed Teacher program functioning. Seed Teachers who were in close contact with her felt the most supported.

### Rationale for this Study

As school districts implement computer technologies, a critical need is to provide continual training and ongoing support. While many teachers and administrators support the idea of hiring full-time specialists to work with students and teachers, often schools do not have the funds to do this. Some proponents of computer implementation argue that it is important for all teachers to grapple with technology issues, so that computers penetrate classrooms and do not stay isolated on the periphery. At any rate, schools look for ideas other than full-time specialists to offer ongoing training and support. The Seed Teacher

program in Vista School District represents a particular form of teacher leadership and a "train the trainers" strategy.<sup>6</sup>

Many researchers agree on the elements of successful staff development, including a tie to whole school goals, opportunity for training and ongoing support, a chance to integrate new learning into classroom practice, collegial learning opportunities, differing types of assistance, time to learn and practice, and "at the elbow" on-site support.<sup>7</sup> Teacher leadership studies focus on opportunities for teachers to make temporal and lateral moves, expanding or changing responsibilities while staying in the teaching corps. Successful teacher leadership models provide work that is important, valued, and difficult, embody symbolic roles which are dignified and exemplify good teaching, set concrete ground rules, have administrative support, and feature incentives which favor collaborative work.<sup>8</sup> Studies of computer implementation indicate the importance of having a vision for computer integration, getting computers into classrooms, and creating structures for learning and supports, including a learning program for teachers, in which they can support each other and learn collaboratively over time. School reform efforts are acknowledged to be complex and particular. Strategies are sought which use available resources and are building-based.<sup>9</sup>

To study strategies for computer implementation, a researcher might look for a program which is well established and long-running, develops teacher leadership, involves immersion in problem-solving, enables teachers to learn with each other and to be helpful, provides enough resources, and focuses on learning.<sup>10</sup>

In selecting a district in which to study teacher training and technology, a researcher would look for one that has a large base of hardware and software, an established teacher training program, a reputation as a state leader in use of computer technologies, and one large enough to contain a variety of schools. The district would need to provide enough technology resources to make a computer implementation effort feasible. If the teacher training efforts are long-standing it is likely that the programs will have taken effect and developed in each school building. If a district is large enough to have several schools, a researcher could examine programs as they evolve in different settings. Finally, if a district is a state leader, the programs represented have garnered the interest of others and merit further investigation. The Vista School District meets these criteria. It is, in addition, a growing suburban school district facing the issues and problems which affect mid-size school districts across the country. The financial situation is threatening due to budget shortfalls in the state legislature. Programs were cut and trimmed for the 1993-1994 school year. It is responding to state and national initiatives to focus on school-centered decision-making, increased use of technology for learning and teaching, and the restructuring of

school regularities which stymie student learning.<sup>11</sup> However, most schools and most programs continue to operate and look like they have for many years. Students go to school in groups of thirty with their age mates, and most do the same things at the same times.

The district has received extra attention and grant money to work on restructuring, which has allowed groups of teachers, administrators, and parents to work together on various reform issues. The district is recognized as one of the state's leaders in use of computer technologies. The TEK Initiative, using student workers to create a network, has been a unique approach to a problem facing most school districts; how to purchase and use computer technologies in an efficient, coordinated, and planned way. The Seed Teacher program has been supported and developed over a period of twelve years. It was developed through a local needs assessment and based on beliefs asserting teacher capacity for learning and leading. It seems to be a "capacity-building" strategy (as recommended by the Rand Change Agent Studies<sup>12</sup>) for the implementation of computer technologies into the schools. Studies of innovation and teacher professionalization call for enhanced collegiality and joint work as teachers improve their practice and their schools.<sup>13</sup> A study of this long-running program provides an opportunity to examine teachers who have received support and recognition for learning and helping their peers over the course of ten years, and who work in leadership roles in their buildings. The study illuminates the ways in which teachers act in these roles and the effects they have on their schools and colleagues.

Fullan makes the point that change happens one person at a time, but that institutional change happens when individual efforts are combined, coordinated and built upon.<sup>14</sup> To understand more about the staff development strategy of technology lead teachers used by Vista schools, it is necessary to follow specific individuals as they work as Seed Teachers, and to set their experiences and reflections against the background of their schools and the views of their peers in school and across the district.

Seed Teachers and the program in which they participate embody many elements cited as exemplary. Seed Teachers take on additional duties in exchange for incentives and resources. They agree to be public learners, solving problems as they go. The program requires them to learn and to help. They assume leadership positions on school technology committees and in other situations involving technology. They take on the responsibility in order to learn, and to help, and to be better teachers. The role carries an enhanced status as "computer expert," which is desired by the participants.

Seed Teachers go into their colleagues' classrooms to help and to model teaching with computers, and the program is supported by teachers collectively. The longevity of the program would seem to indicate a long-term strategy in place, supported by administrators

at building and district levels. The idea features teachers expanding their focus and responsibilities, learning in their buildings and in other settings, leading by example as a learner, and providing help and training to their peers. Seed Teacher effort is recognized by the various incentives provided them, and the whole thrust of the program is focused on their learning. They are required to learn and provided with opportunities and resources to do so. District administrators, principals, colleagues, and Seed Teachers expect that Seed Teachers will "bring teachers out of their caves and into the modern world," model a new way of learning and teaching, provide a model for implementing other innovations, and transform their classrooms.<sup>15</sup> A closer look is required to see what effect participation in the program has on Seed Teachers as they learn, help, and teach.

### **Description of Study including Conceptual Framework and Research Questions**

To answer the research question, "How does participation in a lead teacher support program aimed at computer technology enhancement affect lead teachers as (a) learners, (b) teachers, and (c) helpers?" the study reported in this dissertation examines seven lead technology teachers. The participants include teachers who represent a variety of experiences and characteristics, including tenure as Seed Teachers, levels of computer skill and experience, roles and grade levels in school, age, gender, and teaching experience. The study examines their personal learning with computer technologies and describes how this learning affects them, in their teaching, and in broader arenas. Understanding that the context of the whole school has a powerful influence on the work of each teacher, three diverse schools were selected to represent a spectrum of demographic, leadership, and structural issues.

The primary focus of the study is on the participation of the teachers in the Seed Teacher program and the effects it has on their learning, teaching, and helping, so case studies of each teacher are the main building blocks. Teachers were interviewed four times each and observed three times in their schools. Other data sources include interviews with district administrators, and colleagues in the schools, as well as questionnaires filled out by all of the district's Seed Teachers and colleagues in buildings. The data collection phase took place during the 1993-1994 school year, with the bulk of data collection between January and May.

## **Conceptual Framework**

A graphical representation of the conceptual framework for the study (p. 89) makes visual the emphasis on what Seed Teachers do and how their participation in the Seed Teacher program affects them as learners, helpers, and teachers. Their work as Seed Teachers is shaped by a variety of contextual issues which are examined. The next sections describe the elements of the conceptual framework.

### **Focus on What Seed Teachers Do and What Meaning They Attach to Their Work**

Seed Teachers in Vista Schools are asked to play three main roles; as active learners in the use of computer technologies, as helpers of their colleagues, and as leaders in teaching with computer technologies and sharing this knowledge with colleagues. This study examines Seed Teachers as they work in these roles, studying how participation in these positions affects their learning, teaching, and helping. As technology lead teachers, the study examines what Seed Teachers actually do and what they make of the experience. It asks how being Seed Teachers affects their teaching, and their relationships with colleagues. While the use of lead teachers is widely advocated, and beginning to be studied for detail, little is known about the actual shape of the task and role for technology lead teachers.<sup>16</sup> Advocates pin many hopes on the learning and leadership of teachers in these roles, so it is useful to view the position through the activities and reflections of Seed Teachers. Through interviews and school observations, teachers reflected on their learning and experiences as Seed Teachers. They tracked some of their activities on weekly logs, and recorded their feelings about their accomplishments.

### **Context, Program, and Personal Characteristics Shape The Work of Seed Teachers**

The teachers' experiences are shaped by the features of the Seed Teacher Program, the contexts in which they work, and personal characteristics they bring to the experience. Their participation in the program also leads to changes in the program, in the school and district in which they work, and in personal characteristics such as confidence and technology experience. The program features include assumptions and ideology, purpose and goals, requirements, incentives, supports, and leadership. Studies of innovation implementation suggest that the particulars of a program, the context in which it takes place and the personal characteristics of the change agents all affect the outcomes.<sup>17</sup>

### Characteristics of the Program

The Seed Teacher's work is enabled by the incentives and supports offered and shaped by the expectations on the contract. The program has developed traditions and habits of operation and multiple views of its purpose and goals. Leadership of the Seed Teacher program is a shifting factor and impacts the work of the teachers, as does the flexibility or rigidity of how the program is administered.<sup>18</sup>

### Personal Characteristics

The teachers bring a multitude of personal experience and characteristics to the role of lead technology teachers. Studies of change agents, assisters, and teacher leaders indicate a range of characteristics which impact the work in question. Appropriate to this study are technology background and education, teaching experience, role in the school, organizational skills, and interpersonal skills.<sup>19</sup>

How do teachers' technology backgrounds effect their learning and leadership in their own schools? It might be expected that expert computer-users would take on the Seed Teacher roles. If experts take the roles, do their peers accept them in the role and learn from them? If people with a range of skills and attitudes take on the role, do more teachers learn from them? If districts are looking primarily at learning roles, they would select eager novices to be technology lead teachers and support their learning. If districts are most concerned with providing help to many teachers in buildings, they might select an expert, support the person with resources, and keep the person in the role for many years. Looking at Seed Teachers who fit both descriptions (novice and expert, short and long tenure) enables us to see how the role effects them and their colleagues.

There are stereotyped views regarding gender and age in relation to computer technologies. Conventional wisdom holds that women are more computer-phobic, and that younger people are more tuned in to technology than older people. Studies are mixed on these points. The teachers in most elementary schools are overwhelmingly female, and usually middle-aged. How do Seed Teachers reflect on their experience based on these factors? Huberman's studies on teacher life cycles indicate that the experienced, female, middle-aged teachers are most likely to take on the challenge of a new role, if they have positively negotiated the mid-career examination of their life choices and decided to stay in teaching.<sup>20</sup>

### District and School Context

The context in which the lead teacher works is critical to the success of the project. Specifically, at the building level, important issues are the support of the principal, collegial traditions, level of technical expertise in the building, climate, and procedures. At the district level also, leadership and resources are critical factors. The context, the program and the entry characteristics impact the form and content of the lead teacher's participation in the program. If leadership is strong and continuing, it is likely that an innovation will deepen and continue. In school buildings, principal support is said to matter for long-term implementation. It will effect the work of the Seed Teachers in the building, as they work through scheduling, resource allocation, and various technology issues. Principal stance effects the place of technology innovation in the school and the priority it gets.<sup>21</sup>

Collegial traditions and level of expertise in the building will impact on the Seed Teachers' work. If they are part of a staff which is used to working collaboratively, the job will be different than if they have to continually negotiate access to classrooms and facilitate learning to work collectively on technology issues. A higher level of technology expertise in the building will provide more helpers in the building, and influence the kind of work the Seed Teacher does. It probably affects status, as well.<sup>22</sup>

### **Seed Teacher Role Expected to Affect Approaches to Learning, Helping, and Teaching**

District officials sponsor the Seed Teacher program because they expect changes in approaches to learning, and learning about computers in particular; changes in classroom teaching; and approaches to helping others learn and teach. District officials expect Seed Teachers to learn and change, and they expect that colleagues will be assisted to do the same. The expectation of the district is that investments of time, supports, recognition, and resources will result in improvements in these areas. While it would be useful to closely examine both the Seed Teachers and their colleagues, this study focuses on the impacts of program participation on the participants, as reported by themselves, and their peers, and as observed by the researcher.

Participants, and administrators have high hopes for Seed Teachers. In terms of learning, they hope that Seed Teachers will become skilled users of computers, and that learning about computers will cause them to learn more about the learning process. When Seed Teachers learn to use computers, they will break down the isolation barriers of the classroom and communicate with peers across the district and the world. They will

experience enhanced self-esteem as they add skills and knowledge to their teaching repertoire. As they learn more, they will become better learners.

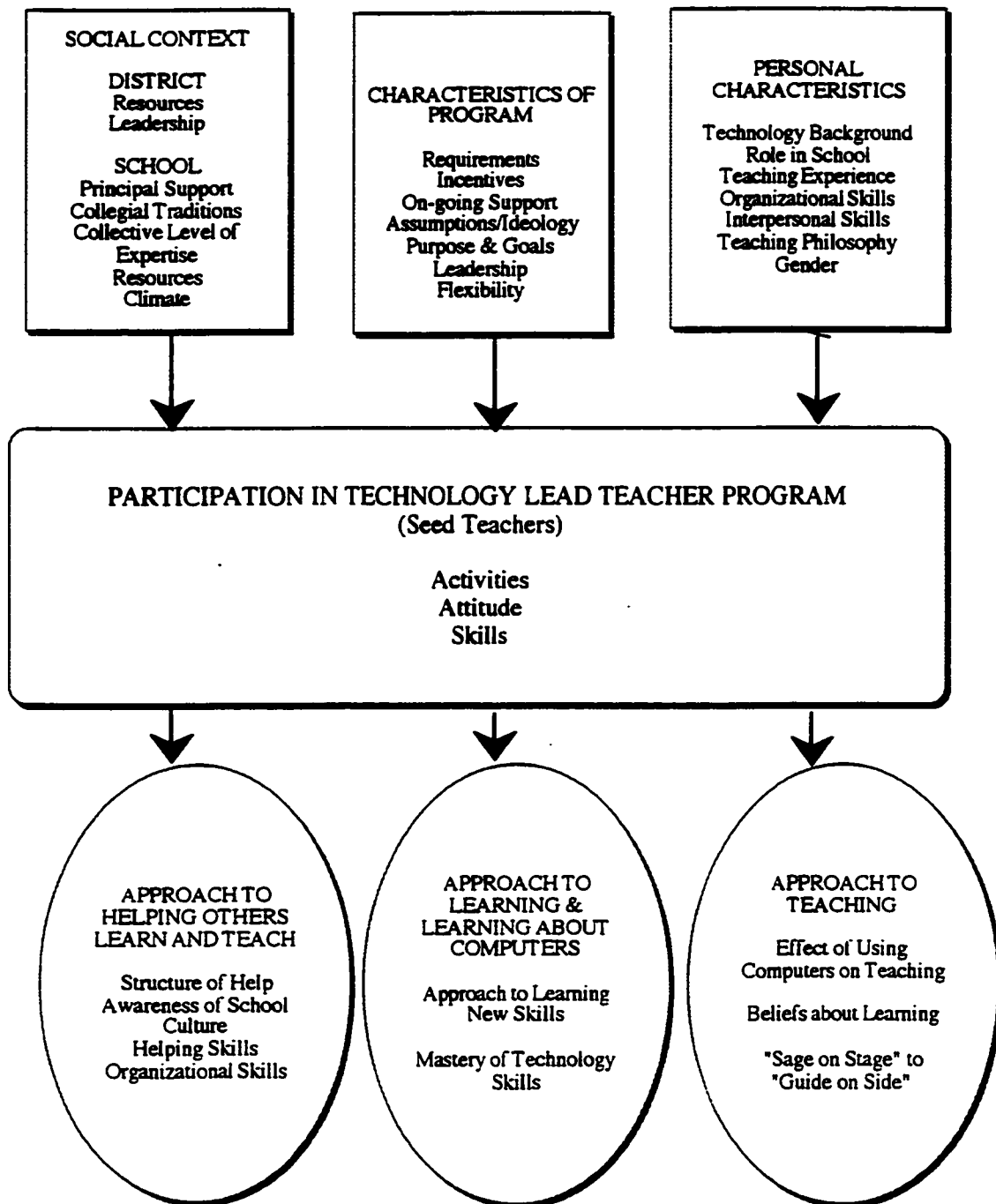
Seed Teacher advocates imagine that Seed Teachers will come out of their classrooms and learn about the culture of their own school and the characteristics of school structure. As they work through technology issues for the school, Seed Teachers will grasp the complexities of a whole school focus, with all of its social, legal, and political realities. By helping each teacher learn to use computers, Seed Teachers will observe much about the different learning styles and needs of the teachers, and will reflect on the meanings of this for the implementation of computer technologies. They will hone organizational and interpersonal skills, becoming more able to lead and participate in all school improvement.

As teachers, Seed Teachers will model technology integration in their own settings. They will move from being "sages on the stage" to "guides on the side." The effect of computer technology implementation in their classrooms will be a change in practice and beliefs and an expansion of opportunities for students.

All of the expectations of Seed Teachers listed above were mentioned as expected outcomes by one of the principal players in the program; Seed Teachers themselves, and building and district administrators. It is hard to imagine that a single program would enable Seed Teachers to meet all of these expectations.<sup>23</sup> Much of the conversation about computers in schools seems exaggerated and grand. The grandness of the talk induces some teachers to try and stay with the effort. An examination of actual experiences and outcomes will reveal what kinds of program features and contexts lead to what kinds of outcomes.

The following graphic representation is the conceptual framework guiding this study. (See Figure 1)

**TECHNOLOGY LEAD TEACHERS:  
PROFESSIONAL DEVELOPMENT FOR COMPUTER USE IN SCHOOLS**



**Figure 1: Conceptual Framework**

## Research Questions

Research questions focus on Seed Teachers in the three roles they play. The same set of questions is repeated for each role. The questions structure the investigation. By keeping logs and reflecting on their work, Seed Teachers list and reflect on their activities. Observations in classrooms, staff meetings, and helping interactions were helpful in adding to the list. As we looked at the activity lists, Seed Teachers described what they do and how they feel about it. They thought about what they will do next in the near and far future.

Seed Teachers described the features of the Seed program on many occasions and responded to questions about the importance of each feature. They said what works for them personally and what does not, and why. Seed Teachers also observed and commented on the work of other Seed Teachers, to provide some distance from their own work and hopes for themselves. Seed Teachers were led through questions about the building and district leadership and support characteristics. They reflected on what helps and hinders them personally.

Seed Teachers thought about and talked about their growth, learning, and effect in their classrooms and schools. They commented continuously on what they learn and how the learning affects their teaching and helping. The job does not separate out in neat categories as Seed Teachers experience it, but they reflected on the job as learners, teachers and helpers.

How does participation in a lead teacher support program aimed at computer technology enhancement affect lead teachers as (a) learners, (b) teachers, and (c) helpers?

### Learners

- 1a To what kinds of learning activities does participation expose lead teachers?
- 2a How do the lead teachers respond to these activities, affectively and behaviorally? How is their response influenced by personal characteristics and background?
- 3a In what ways do the features of the lead teacher program support or inhibit the lead teachers' personal learning?
- 4a How is the learning of the lead teachers constrained or guided by the district and school contexts in which they work?
- 5a How is the lead teachers' mastery of new skills or approach to learning affected?

**Teachers**

- 1b To what kinds of teaching activities does participation expose lead teachers?
- 2b How do the lead teachers respond to these activities, affectively and behaviorally? How is their response influenced by personal characteristics and background?
- 3b In what ways do the features of the lead teacher program support or inhibit the lead teachers' teaching?
- 4b How is the teaching of the lead teachers constrained or guided by the district and school contexts in which they work?
- 5b How is the lead teachers' mastery of new skills or approach to teaching affected?

**Helpers**

- 1c To what kinds of helping activities does participation expose lead teachers?
- 2c How do the lead teachers respond to these activities, affectively and behaviorally? How is their response influenced by personal characteristics and background?
- 3c In what ways do the features of the lead teacher program support or inhibit the lead teachers' helping?
- 4c How is the helping of the lead teachers constrained or guided by the district and school contexts in which they work?
- 5c How is the lead teachers' mastery of new skills or approach to helping affected?

### **Technology Lead Teachers As Strategy for Learning and Support**

The Vista School District has combined several staff development initiatives in order to help teachers provide students with enhanced learning opportunities. During 1993-94, the Seed Teacher program, a staff development strategy using technology lead teachers serving two-year terms, was in its 10th year. The superintendent and assistant superintendent in charge when the program began, both described the program in terms of personal growth and role change for the lead teachers, as well as assistance for their peers. They looked for a way to infuse computer technologies into the schools, and decided that the first step in creating a broad range of opportunities for students, was to do so for teachers. They wanted teachers to be comfortable and competent users of computer technologies, and assumed that if teachers experienced personal growth, they would transfer this experience to the classroom. The lead teachers receive training and they train others. They model a way of working with technology and a way of teaching.

The Vista program uses lead teachers in a "train the trainers" model, in which lead teachers are expected to innovate in their own classrooms and inservice their colleagues.<sup>24</sup> When Sashkin and Egermeier studied successful dissemination efforts, they found that all of them involve some sort of ongoing support and assistance, using a "county agent" model based on the Agricultural Extension Service.<sup>25</sup> County agents take on the job of helping farmers learn about the latest techniques for growing and harvesting crops. County agents continually study and share what they know, passing on what one farmer learns to the next, and linking farmers in the county to others with similar needs, problems, or solutions. County agents use a mixture of research and practical knowledge to help farmers, and they need to think on their feet, and use a range of skills in doing so. Sashkin and Egermeier envision a role like country agents for helping teachers learn to implement new curricula or methods. Seed Teachers in Vista District match this description. They are hired to be learners and problem-solvers in their schools. Seed Teachers function as county agents as they continually learn new information and skills, share what they know, solve problems with individuals and groups of teachers, and link people with resources.

The Seed Teacher program addresses issues of training and ongoing support. It helps beginners get comfortable with the computer, either by being a Seed Teacher and placing oneself in a learning situation, or by placing a colleague helper in the building who provides some training and ongoing assistance. The public helping role creates a positive impetus for learning. Eloise, a Seed Teacher, describes it this way,

"It is an opportunity for people who are interested in computer technology to stretch a little bit...to become more knowledgeable no matter where they are on the spectrum. I don't think a person in the Seed Teacher program has to start out as a real computer whiz. But they have to be willing to put in a lot of time and a lot of effort to get better, especially if they are not very knowledgeable. Because people count on them."<sup>26</sup>

The literature regarding implementation of innovation is consistent about requirements for adoption. Change needs to center on teachers and classrooms, and these are not easy places to understand.

"Everybody now makes the same observation: in order for change to take place in schools, we have to understand the perspectives of the individuals involved. Outside change agents cannot afford to overlook insider perspectives since school improvement--or educational change of any stripe--is a problem that turns on the incentives, attitudes, abilities and responses of those ultimately responsible for seeing that improvement initiatives translate into improved educational services for students..... We do not put theory into practice, but rather into practitioners."  
(Swanson-Owens)<sup>27</sup>

A study of these complex environments and the teachers who work in them provides more information about actual implementors in the context of their daily work. It is framed with the tensions between independent interests and pursuits, the constraints and obligations of the institutions in which they work, and participation in wider professional communities.

- 1 (Apple Classrooms of Tomorrow, 1995; Darling-Hammond & McLaughlin, 1995; Lieberman, 1995a; Means, 1994; Means, Olson & Singh, 1995)
- 2 (Knapp & Glenn, 1996; Office of Technology Assessment, 1995; Sheingold & Hadley, 1990; Wideen, 1992)
- 3 (McLaughlin, 1994; Means et al., 1995; Wilson, Peterson, Ball & Cohen, 1996)
- 4 See appendix
- 5 (Vista School District, 1993)
- 6 (Collins, 1991; David, 1994; Dede, 1995; Dwyer, Ringstaff & Sandholtz, 1990; Means & Olson, 1993; Mecklenburger, 1990; Mergendoller, Johnston, Rockman & Willis, 1994; Office of Technology Assessment, 1995; Strudler, )
- 7 (Corcoran & Goertz, 1995; Cornett, 1995; Darling-Hammond & McLaughlin, 1995; Fessler & Christensen, 1992; Fullan, 1990; Fullan & Hargreaves, 1992; Guskey, 1995; Hargreaves, 1995; Joyce, Wolf & Calhoun, 1993; Knapp & Associates, 1995; Lieberman, 1994; Lieberman & Miller, 1991b; Little, 1993; Lord, 1995; Odden, 1991; Sashkin & Egermeier, 1992; Wilson et al., 1996)
- 8 (Boles & Troen, 1994; Bolman & Deal, 1994; Devaney, 1987; Devaney & Sykes, 1988; Duke, 1994; Fay, 1992; Huberman, 1995; Lieberman, 1992b; Lieberman, Saxl & Miles, 1988; Little, 1988; Little, 1990a; Little, 1990b; Louis & Miles, 1990; Marsh & Crocker, 1991; McLaughlin & Yee, 1988; Miller, 1992; Smylie & Denny, 1990; Troen & Boles, 1994; Wasley, 1989; Wasley, 1992a; Wasley, 1991; Wasley, 1992b; Wasley, 1994; Wigginton, 1992; Yee, 1990)
- 9 (Apple Classrooms of Tomorrow, 1995; David, 1994; Dwyer, 1994; Griffith, 1993; Hawkins, 1994; Haymore Sandholtz, Ringstaff & Dwyer, 1991; Knapp & Glenn, 1996; Lieberman, 1992a; McLaughlin, 1993; Means, 1994; Means & Olson, 1993; Means et al., 1995; Mecklenburger, 1990; Mergendoller et al., 1994; Miles & Louis, 1990; O'Neil, 1995; Office of Technology Assessment, 1988; Office of Technology Assessment, 1995; Placier & Hamilton, 1994; Reyes, 1990; Ringstaff & Yocum, 1994; Rosenholtz, 1989; Rosenholtz & Simpson, 1990; Sturdivant, 1989; Talbert & McLaughlin, 1994; Wiburg, 1994; Wideen, 1992; Willis, 1993; Zorfass, Morocco & Lory, 1994)
- 10 Means et al., 1995; Office of Technology Assessment, 1995; Ringstaff & Yocum, 1994)
- 11 (Apple Classrooms of Tomorrow, 1996; Boyer, 1983; Cohen, 1987a; Cuban, 1984; Cuban, 1986; Cuban, 1993; Darling-Hammond, 1984; David, 1990; Education Commission of the States, 1983; Fullan & Miles, 1992; Goodlad, 1984; Jackson, 1986; Johnson, 1990; Kerr, 1989a; Kerr, 1989b; Lortie, 1975; Louis, 1992; Metz, 1990; National Commission on Excellence in Education, 1983; National Governors' Association, 1986; Office of Technology Assessment, 1988; Sarason, 1990; Shanker, 1990; Sheingold, 1991; Sizer, 1984; Smith & O'Day, 1993)
- 12 (McLaughlin, 1987; McLaughlin, 1990)
- 13 Berman, 1981; Berman & McLaughlin, 1978; Corcoran & Goertz, 1995; Darling-Hammond, 1990; Darling-Hammond, 1993; Lieberman, 1988a; Little, 1982; Little, 1986; Little, 1990b; Little, 1993; Little & McLaughlin, 1993; Rosenholtz, 1989; Rosenholtz & Simpson, 1990; Wise, 1990)

- 14 (Fullan, 1994)
- 15 (Boles & Troen, 1994; Bolman & Deal, 1994; Borko & Putnam, 1995; Corcoran & Goertz, 1995; D'Ignazio, 1995; Darling-Hammond, 1990; Darling-Hammond & McLaughlin, 1995; David, 1994; Devaney, 1987; Fay, 1992; Fessler & Ungaretti, 1994; Fullan & Stiegelbauer, 1991; Guskey & Sparks, 1991; Haymore Sandholtz et al., 1991; Huberman & Miles, 1986; Joyce, Murphy, Showers & Murphy, 1989; Lieberman, 1988b; Lieberman, 1992b; Lieberman & Miller, 1991a; Lieberman et al., 1988; Little, 1988; Livingston, 1992; Troen & Boles, 1994; Wasley, 1991)
- 16 Office of Technology Assessment, 1995)
- 17 (Lieberman, 1992a; Lieberman et al., 1988; McLaughlin, 1987; McLaughlin, 1990; McLaughlin, 1993; McLaughlin, 1994; McLaughlin & Marsh, 1990; McLaughlin & Yee, 1988; Odden, 1991; Sheingold & Hadley, 1990)
- 18 (Apple Classrooms of Tomorrow, 1995; Boe, 1989; Cohen, 1987a; Cohen, 1987b; Cooper, 1988; Cornett, 1995; Fullan, 1990; Griffith, 1993; Harvey, Kell & Drexler, 1990; Huberman & Miles, 1986; Kearsley & Lynch, 1992; Kerr, 1991; Wiburg, 1994)
- 19 (Lieberman, 1992b; Lieberman, 1995b; Lieberman & Miller, 1991a; Lieberman et al., 1988; Louis & Miles, 1990; Miles, Saxl & Lieberman, 1988; Smylie & Denny, 1990; Strudler, ) (Bakke, 1984; Cornett, 1995; Darling-Hammond & McLaughlin, 1995; Floden, Goertz & O'Day, 1995; Fullan & Stiegelbauer, 1991; Joyce, 1990; Joyce et al., 1983; Joyce et al., 1993; Kearsley & Lynch, 1992; Lehming & Kane, 1981; Lieberman & Rosenholtz, 1987; Little, 1989; Louis & Odden, 1991; Office of Technology Assessment, 1988; Office of Technology Assessment, 1995; Quartz, 1995; Ray, 1992; Rosenholtz & Simpson, 1990; Shaw & Reyes, 1992; Sheingold, 1991; Sheingold & Hadley, 1990; Valdez, 1989; Wasley, 1994; Weatherly & Lipsky, 1977; Wiburg, 1994; Wideen, 1992; Williams & Elmore, 1976; Willis, 1993; Wilson et al., 1996; Wyner, 1991; Yocam & Wilmore, 1994; Zeichner, 1991)
- 20 (Acker, 1995; Dupagne & Krendl, 1992; Griffith, 1993; Grossman, 1992; Huberman, 1993; Huberman, 1995; Knupfer, 1993; Krupp, 1994; McLaughlin & Yee, 1988; McPherson, 1972; Meierhenry, 1982; Nias, 1985; Nias, 1989; Sheingold & Hadley, 1990; Smylie, 1995; Waller, 1932; Wasley, 1989; Wiburg, 1994-95; Yee, 1990)
- 21 (Bakke, 1984; Cornett, 1995; Darling-Hammond & McLaughlin, 1995; Floden et al., 1995; Fullan & Stiegelbauer, 1991; Joyce, 1990; Joyce et al., 1983; Joyce et al., 1993; Kearsley & Lynch, 1992; Lehming & Kane, 1981; Lieberman & Rosenholtz, 1987; Little, 1989; Louis & Miles, 1990; Marsh & Crocker, 1991; McLaughlin, 1987; McLaughlin, 1990; Miles, 1981; Odden, 1991; Office of Technology Assessment, 1988; Office of Technology Assessment, 1995; Quartz, 1995; Ray, 1992; Rosenholtz & Simpson, 1990; Shaw & Reyes, 1992; Sheingold, 1991; Sheingold & Hadley, 1990; Valdez, 1989; Wasley, 1994; Weatherly & Lipsky, 1977; Wiburg, 1994; Wideen, 1992; Williams & Elmore, 1976; Willis, 1993; Wilson et al., 1996; Wyner, 1991; Yocam & Wilmore, 1994; Zeichner, 1991)
- 22 (Fullan, 1993; Little, 1982; Little, 1990b; Little & McLaughlin, 1993)
- 23 Cohen, 1987a; Cohen, 1987b; Cuban, 1990; Cuban, 1993)
- 24 (Becker, 1991; Joyce, Hersh & McKibbin, 1983; Office of Technology Assessment, 1995)
- 25 (Sashkin & Egermeier, 1992)
- 26 (Messmer, 1992)
- 27 (Swanson-Owens, 1985)

## **Chapter 4**

### **Research Methods**

Chapter 4 focuses on the research methods used in this study, beginning with the rationale for the qualitative case study design, and explaining the impact of two pilot studies on the current research, and the methods used for selection of cases. Data sources are listed and procedures for data collection and analysis are explained. Procedures are discussed pertaining to validity, reliability, ethics, bias, and reporting the results of this study.

#### **Rationale for Comparative Case Study Design**

The experience of each lead teacher is unique. It is shaped by the personal characteristics of each teacher, and the social context in which he or she works. Many assumptions are made about the benefits of this role for the teacher and the school, but little is actually known. While the use of technology lead teachers as designated experts is widely advocated, and is in place in many districts, the experience of these teachers has not been widely studied, hence the questions reviewed in Chapter 3.<sup>1</sup> The kinds of questions lend themselves to an interpretive or qualitative study.<sup>2</sup>

"Interpretive research is concerned with the specifics of meaning and action in social life that takes place in concrete scenes of face-to-face interaction, and that takes place in the wider society surrounding the scene of action. The conduct of interpretive research on teaching involves intense and ideally long-term participant observation in an educational setting, followed by deliberate and long-term reflection on what was seen there. That reflection entails the observer's deliberate scrutiny of his or her own interpretive point of view, and of its sources in formal theory, culturally learned ways of seeing, and personal value commitments."(Erickson)<sup>3</sup>

Erickson<sup>4</sup> recommends the use of interpretive methods using participant observational fieldwork when one needs to know more about (1) the specific structure of occurrences rather than their general character and what is happening in a particular place, (2) the meaning-perspectives of the particular actors in the particular events, (3) the location of naturally occurring points of contrast that can be observed as natural experiments, and (4) the identification of specific causal linkages. Sensemaking is at the heart of the matter in interpretive research, according to Erickson. This study used a qualitative multiple site case study design. The goal was to understand how the teachers make sense of their roles

as Seed Teachers, and how their work in these roles fits into and is influenced by the larger contexts in which they work.

Examining the way Seed Teachers work and discovering the meanings they make of their work as Seed Teachers involves a research focus which was characterized by the following categories devised by Patton<sup>5</sup>:

1. **Naturalistic inquiry.** Studying real world events as they unfold. Non-manipulative. Openness to whatever emerges.
2. **Inductive analysis.** Immersion in the details and specifics of the data to discover important categories, dimensions, and interrelationships. Explore open questions.
3. **Holistic perspective.** Whole phenomenon under study is understood as a complex system that is more than its parts. Focus on complex interdependencies.
4. **Qualitative data.** Detailed thick description. Inquiry in depth. Direct quotations capture people's personal perspectives and experiences.
5. **Personal contact and insight.** Researcher's personal experiences and insights are an important part of the inquiry and critical to understanding the phenomenon.
6. **Dynamic systems.** Attention to process. Assumes change is constant.
7. **Unique case orientation.** First level of inquiry is being true to, respecting, and capturing the details of the individual cases being studied. Cross-case analysis follows from and depends on the quality of individual case studies.
8. **Context sensitivity.** Places findings in a social, historical, and temporal context.
9. **Empathetic neutrality.** Researcher's passion is understanding the world in all its complexity. Researcher includes personal experience and empathic insight as part of the relevant data, while taking a neutral non judgmental stance toward whatever content may emerge.
10. **Design flexibility.** Open to adapting inquiry as understanding deepens or situation changes. Pursues new paths of discovery as they emerge.

The characteristics of several traditions of qualitative research provide the underpinnings for the case study of lead technology teachers. Merriam says that qualitative

case study is "an intensive, holistic description and analysis of a bounded phenomenon."<sup>6</sup> The phenomenon of interest here is the participation of teachers in the Seed Teacher program, and the effects this has on their learning, teaching and helping. An ethnographic tradition and orientation allows the researcher to examine a culture from the perspective of an insider and with the eyes of an outsider.<sup>7</sup> In looking at schools, which are so familiar to most observers that they cannot really see what is going on, Spindler urges researchers to make the familiar strange, to take as many perspectives as possible on a situation.<sup>8</sup>

The value of a case is greatly enhanced when the case can be "located as an instance of a more general class of events" (Smith).<sup>9</sup> The cases under study here belong to the general class of lead teachers, and more particularly, technology lead teachers, as a professional development strategy. An interpretation based on findings from several cases is often more convincing than that of a single case. "By comparing sites or cases, one can establish the range of generality of a finding or explanation, and at the same time, pin down the conditions under which that finding will occur" (Miles and Huberman).<sup>10</sup> This study includes seven case studies of individual Seed Teachers in their own schools. It also involves a cross-site analysis. The teachers and schools have been selected to build in maximum variety for comparison and contrast. The collection of individual stories from three schools, supplemented by questionnaires from 31 Seed Teachers and 77 colleagues, generates understanding about this strategy of staff development and its effect on individuals and schools.

### **Pilot Study**

A pilot study was completed in the spring of 1992, which focused on several areas of technology use and training in Vista School District. The pilot involved a single case study, questionnaires, and interviews. The single case focused on Eloise Gallagher, Seed Teacher at Cascade Park Elementary. The pilot study also involved surveying all the teachers of Vista School District about the use of their computers and their needs for training and support, and interviewing district and technology administrators about technology in the district, plans for staff development, and the Seed Teacher program as an implementation strategy. The pilot study led to the current research, and established a history and context for an in-depth examination of specific teachers working in the context of three particular schools. Specifically, the study of Eloise identified the multiple roles filled by the Seed Teachers, and the different expectations of them by persons in various levels of the school and district. Write-in answers on the all-district survey and the

additional survey of teachers at Cascade Park revealed issues of concern to teachers and their general levels of satisfaction and dissatisfaction with support for their learning with technology. The comments of Eloise and other teachers helped identify possible participants for a case study, in which variety and diversity were important. Eloise Gallagher was re-interviewed and observed, and included in the seven teachers studied in the year 1994.

After analyzing the pilot study, interview questions were written for the current study. An interview was conducted with a Seed Teacher in the school in which I worked. She answered all of the proposed interview questions and added reflections and suggestions of her own. Based on her responses, new interview questions were written.

### **Selection of Cases**

The Seed Teacher program was in its tenth year during the research study. It has operated in all of the elementary schools since its inception. A truncated version of the program was provided to the middle and high schools in 1991. The elementary schools were chosen as they are the sites in which the program has had the most opportunity to work, therefore providing the most possibilities for improved practice by the accumulation of trained staff, development of habits and traditions and opportunity for variety.

### **Selection of Schools**

Of the ten elementaries, only six were old enough to have had Seed Teachers since the beginning. Included in the six were two schools linked in an unusual grade configuration model and undergoing a major change in the year of the study. One of these had selected the same teacher to serve as Seed Teacher off and on for six years. These two sites were eliminated as too complicated and atypical for a focus on Seed Teachers in the 1993-94 school year. An examination of the current and former Seed Teachers in the remaining four schools led to the selection of six teachers in three schools. All three schools have been in operation for the duration of the Seed Teacher program, and they differ in economic demographics, focus on technology, level of technical expertise of the staff (as self-described in survey), number of former Seed Teachers, and leadership by the principals. The following chart illustrates the characteristics of the three selected schools. (See Figure 2)

<b>Characteristics of the Three Elementary Schools</b>						
	<b>Number of Students</b>	<b>Number Former Seed Teachers</b>	<b>Economic Diversity</b>	<b>Technology Background</b>	<b>Technical Expertise of Staff</b>	<b>Principal Leadership</b>
<b>Cascade Park</b>	500	7	Most diverse in district	Network in place. Partial use by teachers  Most computers in lab	33% Beginners  67% Intermediate	Tom Williams supports Seed Teacher as learner.  Provides assistance.
<b>Vintage</b>	450	5	Mostly middle class	3-yr. grant for technology enhancement  fully online	16% Beg. 73% Int. 11% Expert	Rick Sudbury supports Seed Teacher as learner. Picked novice
<b>Lakeland</b>	625	2	Mostly middle class	Network in place. Used for bulletin and e-mail.	52% Beg. 44% Int. 4% Expert	Susan Sutton wants tech. support in bldg.

**Figure 2: Characteristics of Elementary Schools Selected For Study**

### **Selection of Teachers**

Two teachers were selected at each of the schools (plus Eloise, the participant of the original pilot study) to permit data to be gathered on each teacher's view of the other's role as a Seed Teacher, and to give a second perspective on how the school was viewed. The group of selected Seed Teachers includes one of the founders of the program, three teachers in the first year of their two-year term, one in the second year of her term, and two who are former Seed Teachers. They range in technical skills from beginners to advanced users, as categorized by their own description and researcher observations. Some of the Seed Teachers were described as exemplary and two received mixed reviews on their performance from fellow staff members. (See Figure 3)

<b>Case Selection of Lead Technology Teachers by Personal Characteristics and Experience</b>							
	<b>Eloise</b>	<b>Cindy</b>	<b>Barry</b>	<b>Sylvia</b>	<b>Ned</b>	<b>Grace</b>	<b>Jack</b>
<b>Seed Status</b>	Former 90-92	Former 91-93	Current 92-94	Current 93-94	Founder 83-85 88-89	Current 93-95	Current 93-95  First Term 85-87
<b>School</b>	Cascade Pk.	Cascade Pk.	Cascade Pk.	Vintage	Vintage	Lakeland	Lakeland
<b>Tech. Expertise</b>	Skilled User	Beginner	Beginner	Intermediate Skills  Novice Troublesht.	Skilled User and Designer	Intermediate Skills	Skilled User  Longtime Hobbyist
<b>Role in School</b>	Librarian K-6grades	5th Grade Teacher	5th Grade Teacher	1st Grade Teacher	5th Grade Teacher	Physical Ed. K-6	2nd Grade Teacher
<b>Years of Teaching</b>	10 years in schools  5 years Librarian  Child Break  5 years Teacher	25 years in schools  Mostly elementary teaching  Middle School P.E.	17 years in schools  Elementary public and private  High School Delinquents	11 years in schools Teaching  6 at Vintage  Child Break  Part-time Coordinator	20 years Teaching varied elementary grades  Started private school	18 years Teaching P.E.  PE Coordinator for Vista District  Child break	22 years in schools  Mostly Elementary Teaching  17 years at Lakeland
<b>Gender</b>	Female	Female	Female	Female	Male	Female	Male
<b>Age</b>	40's	50's	30's	50's	40's	40's	50
<b>Partner</b>	With Sharon Equal Skills  With Cindy Experienced	With Eloise Beginner  With Barry Experienced	With Cindy Beginner  With Shelly Experienced	With Merry Beginner	With Carin Equal Skills  Alone-2nd Term	With Jack Equal Skills	With Grace Equal Skills
<b>Peer Review</b>	Very Positive	Mixed	Positive	Mixed	Positive	Very Positive	Very Positive

**Figure 3: Characteristics of Seven Lead Teachers in Study**

## **Data Sources**

The basic elements of data collection in case studies are direct observation, systematic interviewing, examination of primary and secondary documents and collection of cultural and physical artifacts.<sup>11</sup> This study includes these elements as well as the use of questionnaires.

Teachers were observed in their classrooms three times and at least once in a support role to other staff. I looked for class arrangement and organization, relationship with students, and computer use. Teachers were interviewed four times, reflecting on their personal growth, and their roles as learner, teacher, helper, and leader. Current Seed Teachers were asked to keep and share work logs, which contained notes on jobs they had done and reflections of the work. The teachers had varied track records with the logs, but all attempted them. We discussed the work logs (or whatever notes they kept) at each interview. Keeping the work logs enabled the participants to reflect weekly on their job as Seed Teacher, their accomplishments, frustrations, and reactions and feelings to the job. They provided another method of communication and another avenue of reflection. The interviews and observations took place over a four-month period in the winter and spring.

The interviews were semi-structured to allow for investigation across several sites. As new questions emerged from data analysis, they were added to all interviews. Each interview was recorded and transcribed. I took notes during each interview in addition to the tape recordings. After each interview or observation, I added to my notes and noted in a separate place my reactions and comments on the interview. I kept a running data account sheet to track if I was getting the information I was seeking.<sup>12</sup>

To understand the dynamics of each school, formal interviews were held with three people at each site: the principal, the teacher association representative, and another teacher. I observed in each Seed Teacher's classroom on at least three occasions and was in each school several times in order to conduct all of the interviews and observations.

I attended at least one staff meeting per school and surveyed all of the teachers about their attitudes regarding the Seed Teacher program and their use of it. The building surveys listed many activities conducted by Seed Teachers and asked colleagues to say which were of personal benefit to them and to rate how helpful Seed Teachers have been in the growth of their computer-using skills. Colleagues estimated how often they asked Seed Teachers for help and also listed how many Seed Teachers and former Seed Teachers they thought were in the school. They listed data about their personal computer use and gave

opinions about whether the Seed Teacher program is a benefit to the school and whether it should be continued. Colleagues marked if they would like to take a turn as Seed Teacher.

Interviews with technology and central office leaders in the district helped locate the Seed Teacher program and the experiences of each teacher in the district context. I interviewed Betty Tucker, a Seed Teacher founder as elementary principal, who is now the Director of Curriculum and Staff Development and in charge of Seed Teachers. She took over the responsibility for the Seed Teachers from Wes Wright-Technology Manager. I interviewed Wes Wright and Joanie Land-Technology Team Leader two years ago and again during this study to determine the district directions and support for the program. Joanie is the actual link between Seed Teachers and the district office staff. Todd Everett, a high school teacher of TEK students, has recently been hired as a technology staff developer. He provided a broad view of the scope of the program over the years and the fit between the energy focused on the TEK Initiative and that going to the Seed Teachers. These interviews provided a frame for viewing the work of individual teachers in individual schools and a picture of the district goals for the program.

At a Seed Teacher meeting (and after), all 31 of the district's Seed Teachers filled out a questionnaire regarding their work as Seed Teachers. They were asked about the benefits and drawbacks of the program, asked to rate their skills before and since being Seed Teachers, and estimate the percentage of their staff they had assisted. They wrote why they believed the Seed Teacher program to be an effective or ineffective strategy for infusing technology into the district. They listed elements of the program which could be changed and suggested improvements. They marked a list of activities they do as Seed Teachers and rated the top three in importance.<sup>13</sup>

I examined relevant district documents regarding the Seed Teacher program, including meeting minutes, Seed Teacher contracts, and Seed Teacher reports. Key documents were summarized on a document summary form. Other data sources included participant observation in district Seed Teacher meetings and activities, plus attendance at the lead team meetings twice a month for the Technology Initiative. I reviewed press articles, contracts and records pertaining to the program since 1983.<sup>14</sup> (See Figure 4)

<b>Data Sources</b>		
<b>Cascade Park Elementary</b>	<b>Vintage Elementary</b>	<b>Lakeland Elementary</b>
3 Seed Teachers 4 Interviews 3 Observations Work Logs Principal Colleague-Association Rep. Colleague-Current Seed Colleague-Former Seed Survey-32/32 Respondents	2 Seed Teachers 4 Interviews 3 Observations Work Logs Principal Colleague-Association Rep. Colleague-Current Seed Survey-19/22 Respondents	2 Seed Teachers 4 Interviews 3 Observations Work Logs Principal Colleague-Association Rep. Colleague-Librarian Survey-26/28 Respondents
<b>Survey of 31/31 Current Seed Teachers</b>		
1993-94 Interviews Technology Director Technology Team Leader Director-Curriculum and Staff Development Instructional Technology Specialist Seed Teacher-Endeavor Elem. Pilot Study	Participant Observation Seed Teacher Meetings Documents Meeting Minutes Public Relations Material Work Contracts Program Records	1992 Pilot Study Interviews Superintendent Asst. Superintendent Technology Director Technology Team Leader 2 Founding Seed Teachers 1992 Survey of all teachers in Vista School District 1992 4 Interviews with Eloise Multiple Observations

**Figure 4: Data Sources**

### **Procedures for Data Collection and Analysis**

In qualitative research, the process of data analysis is ongoing and is characterized by the interactive nature of data collection, analysis and reporting. Data are sifted through, combined, reduced and interpreted as the study progresses. Data analysis is a dynamic process in which the researcher searches for patterns, regularities, discrepancies based on a preponderance of the data. In this study, interview were recorded and transcribed. After each interview, a summary sheet was prepared to highlight what happened briefly and any

thoughts I had about it. I constructed various matrix and charts to track the emerging data. Examples of data analysis tools are in the appendix to this report.<sup>15</sup>

Miles and Huberman (1995) advocate the use of qualitative methods to "preserve chronological flow, access local causality, derive fruitful explanations and make new theoretical integration's."<sup>16</sup> They urge researchers to use displays to communicate information and to discover it. Displays in my study were a tool for thinking and analysis. Analysis consisted of data reduction, data display, and conclusion drawing and verification.

Each Seed Teacher's story is a case study. The case studies are clustered by school. Each contains a verbal picture of the school and its context, a description of the teacher and classroom, vignettes of work as a Seed Teacher, and a reflective review. These individual cases are then placed together for comparison and contrast, with the addition of information from the district and historical levels of influence. Conclusions are based on the individual and collective experiences of the Seed Teachers. I used a variety of strategies to analyze the responses from Seed Teachers, including counting, noting patterns and themes, seeing plausibility, clustering, making metaphors, splitting variables, subsuming particulars into the general, and noting relations between variables. As the analysis progressed, I used the tactics which seemed appropriate as the data grew, representing them in various displays to get an analytic handle on what I was finding. Miles and Huberman also recommend a number of tactics for testing or confirming theories or ideas as they emerge; checking for representativeness, checking for researcher effects, triangulating, making contrasts and comparisons, checking the meaning of outliers, checking out rival explanations, looking for negative evidence, and getting feedback from informants. I used these strategies to make sure that the research report is accurate and meaningful.<sup>17</sup>

Initially I worked with Ned Masters, the software designer who was one of the seven Seed Teachers, to design an analysis tool with the program *File Maker Pro*. I entered all of the data for Vintage Elementary, sorting by research questions.<sup>18</sup> The task proved too difficult and cumbersome, so I worked out another strategy for analyzing interview and observation data. I read and reread the interview transcripts, and made a large matrix of interview questions and teacher responses. In constructing the matrix, I selected the essence of the answers to each question, and eliminated off-track asides, and redundant answers. After the matrix was completed, I studied it and wrote portraits of each teacher, using data from interviews and observations. I then reread the transcripts while listening to the tapes to make sure I was attending to the feelings and attitudes expressed in

each. The matrix was then used to answer the research questions with the information from all seven teachers, comparing and contrasting their responses. I used this information to expand the portraits to include a narrative of each Seed Teacher as a learner, teacher and helper, with a summary of what was helpful and hindering to each one. Throughout this process, themes emerged which are common to all of the teachers. Information from surveys, documents, and observations was used to support and check the case study results.<sup>19</sup>

Data from the two surveys were entered into the spreadsheet program, Excel and frequencies gathered and charted for each question. Tables representing some of the data appear in this report.<sup>20</sup>

### **Dealing with Internal Validity, Reliability and External Validity**

Research results in education form "conceptual stabilities which are platforms for understanding and for action" (Kemmis).<sup>21</sup> In all research, it is necessary for researchers and others to be able to trust the research, to know that the results are reliable and valid. Regardless of whether a study is experimental or interpretive, these concerns can be addressed by careful attention to the conceptualization of the study, and the way the data are collected, analyzed, interpreted and reported.<sup>22</sup> Some researchers argue that validity and reliability should be reconceived when used with qualitative research and they propose various ways to do it. Ultimately, the basic question is the same: "Can the results of a study be trusted?"

"Internal validity deals with the question of how one's findings match reality. Do the findings capture what is really there? Are investigators observing or measuring what they think they are measuring?" (Merriam).<sup>23</sup> Qualitative research is understood to be holistic, multidimensional and representative of multiple realities. People's conceptions of reality are what is observed and noted. It is the responsibility of the researcher to present "a more or less honest rendering of how informants actually view themselves and their experiences" (Taylor and Bogdan).<sup>24</sup>

Based on a reading of qualitative researchers, Merriam (1988) describes six basic strategies a researcher can use to ensure internal validity:

- 1) Triangulation is the using of multiple investigators, multiple sources, or multiple methods to confirm emerging findings.
- 2) Member checks involve taking the data back to the people involved and asking for their response.

- 3) Long-term observation and repeated observations strengthen the validity of the findings.
- 4) Peer examination is the process of asking peers to read and critique the researcher's work as it progresses.
- 5) Participatory modes of research involve participants in all aspects of the research.
- 6) Identifying researcher biases at the outset and throughout the research diminish the possibility for erroneous findings.

The Seed Teacher study involves observation, interviews, questionnaires, and document analysis, and collecting the views of a diverse group of people over time. Seed Teachers were informed of the purpose of the study and helped in the ongoing development of the interview questions. Emerging ideas were checked with them for their responses.<sup>25</sup>

Reliability is the extent to which one's findings can be replicated. If someone else were to repeat the study, would they find the same things? In qualitative research, the researcher studies and describes unique situations. Guba and Lincoln suggest that thinking about this issue as consistency or dependability of the results is a preferable way to assess the results based on the data. Instead of hoping that others could replicate the study results exactly, the goal is that others would agree, that given the data collected, the results make sense.<sup>26</sup>

Merriam (1988) suggests that a researcher use three techniques to make sure his or her results are dependable:

- 1) Investigator's Position. The researcher should explain the conceptual base of the study, his or her relationship to the study and participants, the basis for selecting participants and sites, and the social contexts of the study.
- 2) Triangulation. This concept, already explained, strengthens reliability as well as validity.
- 3) Audit Trail. The researcher describes in detail how data were collected, how categories were derived, and how decisions are made throughout the study. This is similar to the evidentiary warrant described by Erickson.<sup>27</sup>

In the study of Seed Teachers, I have been explicit and thorough throughout the study in describing my relationships, opinions and biases regarding the participants, gathering data from various people through various methods, and providing a written record detailing study decisions.

External validity is concerned with the extent to which the findings of one study can be applied to other situations. This is the issue of generalizability in experimental and survey designs. Qualitative research is not generalizable in this way. This is not the intent of it. Researchers have chosen to think of this concept in other ways. Merriam<sup>28</sup> describes conceptualizations of generalizability refocused to working hypotheses (Cronbach), concrete universals (Erickson), naturalistic generalization (Stake) and user generalizability (Wilson and Walker). These ideas suggest that a reader of qualitative studies can gain a working hypothesis, based on the findings in one situation, of possibilities which might hold true and which can be tested in another situation. Erickson argues that generalities can be found in particular situations, especially across several particular situations. What is learned in one situation is carried into one's perspective in viewing the next situation. This is how people cope day to day in the ordinary world and it can be the way to learn from the observations of others. Naturalistic generalization extends this idea of looking at a particular situation in a thorough way and then seeking patterns in new contexts or situations. Reader or user generalizability leaves the question to the reader. The researcher suggests "general" meaning for the data analyzed. To the extent that the reader believes, he or she can use the results in another situation, they will apply it at will.<sup>29</sup> Another conception is generalizing to theory. The results of a study are to suggest plausible general frameworks for approaching the phenomenon under study.

All of these conceptions of external validity are based on foundations the researcher establishes by providing rich, thick description so that a reader may apply personal judgment in assessing its use. The researcher needs to establish the typicality or modal nature of the cases, so that readers can make comparisons with other situations. The use of a multitude of cases and cross-case analysis provide more possibilities for extended use and understanding of the study.

### **Ethics and Bias**

All researchers must address issues of ethics and bias. The investigator examines the extent to which he or she affects the lives of the people and situations under study. Walker lists five issues case study researchers encounter: (1) becoming involved in the issues, events or situations under study, (2) confidentiality, (3) competition between competing groups for access to and control over data, (4) problems with publication, such as confidentiality, and (5) problems from the readers being unable to distinguish between data and researcher opinion.<sup>30</sup>

I have worked in the Vista district for six years, as an elementary school library media specialist. In this capacity, I have been the colleague and observer of nine Seed Teachers in three schools. I have been a part of the weekly meetings of the TEK Initiative since the fall of 1990. During this time, I have been a university student, studying issues of computer technologies, school reform, politics, sociology, and policy. I have been observing and participating in technology decisions in the district since my arrival. Some of my papers and descriptions of technology programs in the district, the TEK Initiative, and the Seed Teacher program have been shared with teachers who requested them, with the technology leaders and with many Central Office administrators. Pseudonyms for personal and place names were used in my papers, but some people and incidents were identifiable to those involved. This level of sharing observations and analysis has been acceptable to those who participated in the studies.

For the past several years, I have taught a series of inservice courses in Vista school district in conjunction with a local university. These classes in "Computer Technologies and Active Learning", at beginning, intermediate, and advanced levels, are offered in the school libraries and computer labs in which I am working. I have worked with 200-300 teachers, administrators, classified staff, and parents from Vista schools and the surrounding areas. Three of the seven seed teachers in this study have been students in these courses. Sylvia took the course in the summer of 1993, and from our experience as student and teacher, she clarified what made her uncomfortable and what she needed as a student of computer technologies. Grace and Jack also took the courses, Grace for two quarters, and Jack for three. Grace is currently enrolled in one of these courses in the 1995-96 school year. Observing these three teachers as learners gave me more information about them as learner/helpers in their schools. The trusting relationship we all developed probably was a factor in them agreeing to be part of a study, and I believe, led to more candid and sometimes, critical, answers to interview questions. All three teachers perceived me to be more like a colleague and co-learner than a teacher.

District librarians meet regularly to conduct planning and coordination of resources. As individuals, many participate in a regional librarians' group, for which Eloise is the secretary. The group hosts monthly book review sessions at a local university, and Eloise coordinates much of this work. We also see each other at two monthly meetings, one for all district librarians, and one for elementary librarians. Thus, I have seen Eloise at work in regional and district meetings, in her library, with her staff, and with students.

By viewing classrooms, staff meetings, Seed Teacher meetings, and staff helping interactions, and by reviewing the interviews, work logs, and written records, I used diverse sources of information from several points of view. My familiarity and involvement in the district allowed me an insider's access to people and information and the varied sources of data provided balance and distance. Although I now work part-time in district technology support in which I assist Seed Teachers, during the study I was a library media specialist in one building, Endeavor Elementary.<sup>31</sup> I kept a "Researcher Log" throughout the study to contain my personal reflections and speculations about the participants and the data.

Pseudonyms are used in this research report and in any public discussion of findings. Nevertheless, I do work in the district under study, and it would be possible for the persistent investigator to piece together information, linking me to the district, and then figure out who the participants might be. This information was shared with the participants, and was acceptable to them. The seven Seed Teachers who were the focus of the study allowed the others in the study to know their identity. All seven teachers acted casually and seemed unconcerned about the confidentiality of the information, even though they were candid in their observations about people and events. In a couple of incidences, a teacher asked me to turn off the recorder and told me information in confidence, usually negatively critical of a colleague. These observations are not used nor cited.

### **Reporting the Results**

The goal of this research is the production of a doctoral dissertation. The report given to the district will be an abbreviated summary with recommendations. Any published articles using identifiable data will be checked with the source participants.

### **Conclusion**

Qualitative methods are used to locate specific situations in the context of broader issues and investigations. In order to understand what exactly Seed Teachers do as technology lead teachers, and how the role effects them in their schools as learners, helpers, and teachers, I studied individuals and their colleagues in the context of their work places.

## Notes to Chapter 4

- 1 (Mergendoller, Johnston, Rockman & Willis, 1994; Office of Technology Assessment, 1995)
- 2 (Altheide & Johnson, 1994; Barzun & Graff, 1992; Bell, 1993; Denzin & Lincoln, 1994; Jaeger, 1988; Miles & Huberman, 1994; Spindler & Spindler, 1987; Spradley, 1980; Stake, 1995; Taft, ; Wolcott, 1990; Wolcott, 1994; Yin, 1984)
- 3 (Erickson, 1986, p. 156)
- 4 (Erickson, 1986)
- 5 (Patton in Fraenkel & Wallen, 1993, p. 382)
- 6 (Merriam, 1988, p. xiv)
- 7 (Fetterman, 1989)
- 8 (in Fraenkel & Wallen, 1993)
- 9 (Smith & Geoffrey, 1968, p. 335)
- 10 Miles & Huberman, 1994, p. 151)
- 11 (Yin, 1984)
- 12 (Briggs, 1986; Denzin & Lincoln, 1994; Miles & Huberman, 1994; Schubert, 1992; Wolcott, 1994)
- 13 (Babbie, 1990; Fowler, 1993; Jaeger, 1988)
- 14 (Merriam, 1988; Miles & Huberman, 1994; Wolcott, 1994; Yin, 1984)
- 15 (Denzin & Lincoln, 1994; Erickson, 1986; Fetterman, 1989; Fraenkel & Wallen, 1993; Glaser & Strauss, 1967; Hammersley & Atkinson, 1992; Miles & Huberman, 1994; Wolcott, 1990; Wolcott, 1994)
- 16 Miles & Huberman, 1994)
- 17 (Becker, 1986; Casey, 1995; Denzin & Lincoln, 1994; Erickson, 1986; Fetterman, 1989; Fleming & McGinnis, 1985; Fraenkel & Wallen, 1993; Glaser & Strauss, 1967; Goodson, 1992; Hammersley & Atkinson, 1992; Lightfoot, 1983; Merriam, 1988; Miles & Huberman, 1994; Somekh, 1993; Stake, 1994; Stake, 1995; Wolcott, 1990; Wolcott, 1994; Yin, 1984)
- 18 (Cresswell, 1994; Silverman, 1993; Weitzman & Miles, 1995; Yin, 1993)
- 19 (Denzin & Lincoln, 1994; Dwyer, Ringstaff, Sandholtz, Keirns & Grant, 1990; Erickson, 1986; Wasley, 1989; Yin, 1984)
- 20 (Babbie, 1990)

- 21 (Kemmis in Merriam, 1988, p. 164)
- 22 (Alasuutari, 1995; Guba & Lincoln, 1981; Marshall, 1995; Sagor, 1992)
- 23 (Merriam, 1988, pp. 166-167)
- 24 (in Merriam, 1988, p. 168)
- 25 (Goodson, 1992; Hammersley, 1992; Hargreaves, 1996; Merriam, 1988; Miles & Huberman, 1994; Witherell & Noddings, 1991; Wolcott, 1994)
- 26 (Guba & Lincoln, 1981)
- 27 (Erickson, 1986; Merriam, 1988)
- 28 (Merriam, 1988, p. 175)
- 29 (Denzin & Lincoln, 1994; Erickson, 1986; Merriam, 1988; Stake, 1994; Stake, 1995)
- 30 (in Merriam, 1988, p. 179)
- 31 (Altheide & Johnson, 1994; Barzun & Graff, 1992; Bell, 1993; Fetterman, 1989; Miles & Huberman, 1994; Spradley, 1980; Stake, 1994; Stake, 1995; Witherell & Noddings, 1991; Wolcott, 1990; Wolcott, 1994)

## Chapter 5

### Survey Results and Organization of Case Study Reports

This chapter is a report of Seed Teacher surveys and a preview of the organization of the case reports. A survey of all Seed Teachers was conducted in the spring of 1994. One hundred percent of the current Seed Teachers responded to questions about their participation as Seed Teachers, their ideas about their skills and helpfulness to colleagues, and their hopes for the future of the program. Their responses collectively form the background for the in-depth study of seven Seed Teachers. After an explanation of survey findings, Chapter 5 concludes with an organizational preview of the next three chapters, which present the narrative case stories of the seven Seed Teachers.

#### Survey Results-All Seed Teachers

All of the 31 Seed Teachers in the 1993-1994 school year wrote answers on a questionnaire containing open-ended and multiple choice questions about their participation as Seed Teachers.<sup>1</sup> The surveys were used primarily to find out what activities were done by Seed Teachers, how they valued their contributions, and what they needed to do the job better. They also were one more way to collect information from the current Seed Teachers who were participants in the case study. The information given by the large group was used to compare with the information from the seven teachers in the study.

The 31 Seed Teachers had served for the following number of years;

<b>Years Served as Seed Teachers</b>						
	1 year	2 years	3 years	4 years	5 years	6 years
Number of Teachers	12	8	8	1	0	2

Although the Seed Teacher program was designed to involve many teachers and to rotate involvement every two years, this chart shows that some schools kept the same Seed Teacher for several years. Two teachers, Ace Rockwood and Jerry Joseph, have served off and on for six years, and one third of the Seed Teachers were serving more than 2-year terms.

When asked about the benefits of being a Seed Teacher, the most important one for Seed Teachers was the opportunity to learn about technology. With less than half the answers, the next three benefits listed were the opportunity to help, share and teach inservices; the computer or stipend; and the opportunity to be "in the know" with technology

issues. Overwhelmingly, Seed Teachers reported the main drawback of the job to be "not enough time." They were also concerned that it interrupted their teaching, caused friction with colleagues, and was too much work. Despite concerns and fatigue, they reported overwhelmingly that the program is "an effective strategy for infusing technology into the district."

Seed Teachers were asked to rate their skills before and since being Seed Teachers.

<b>Skills Before and Since Being Seed Teachers</b>		
	<b>Before</b>	<b>Since</b>
<b>Beginner</b>	17	1
<b>Beginner Plus</b>	3	2
<b>Intermediate</b>	10	20
<b>Intermediate Plus</b>	1	4
<b>Expert</b>	0	3

Several teachers were uncomfortable with the choices, and added categories of beginner plus and intermediate plus to describe their skills. "Expert" was a poor word choice for the survey as few teachers are willing to rank themselves as experts. All Seed Teachers reported an increase in their skills, with the majority reporting growth from beginning to intermediate skills.

As Seed Teachers develop as "personal learners with computers, helpers of their colleagues, and leaders in teaching with computers," they reported the most important elements of the program to be:

- 1) opportunity to help, share, and teach inservices
- 2) opportunity to learn about technology
- 3) meeting and networking with other Seed Teachers.

When asked about the personal benefits of being a Seed Teacher, most respond that the opportunity to learn is most important. When they take a step back, and think about the program as a whole, they give the most importance to the helping role. By a majority, Seed Teachers say to make no changes to the program. Most seemed to make the assumption that changing it meant eliminating or cutting the program. If they could improve it, they would add more time, training, and opportunities for networking and communication.

One of the purposes of this study was to find out what Seed Teachers actually do. They were presented a list of activities derived from observation, the contract they sign and interviews. They were asked to check all activities they do. The following numbers of Seed Teachers report that they do these activities:

<b><u>Teachers</u></b>	<b><u>Activity</u></b>
29	Troubleshoot on equipment problems
28	Participate in building and district technology committees
27	Review and advise about software
27	Assist with e-mail
26	Keep track of equipment
25	Relay information to staff about technology issues
24	Advise on technology issues
23	Act as liaison between staff and Tech kids
22	Teach classes on computer use
21	Teach classes on specific programs
17	Keep track of software
15	Maintain and run computer lab
12	Other
11	Teach model classes (demonstrate with students)

When Seed Teachers were asked to list the three activities which they consider to be the most important they do, the 21 teachers answering the question listed troubleshooting, teaching classes on specific programs and teaching classes on computer use. Notable in their responses is the spread of opinion and jobs that they do. Apparently the job takes on different characteristics in each building and Seed Teachers help according to what they can do and what they consider the most important.

### **Format for Organization of Case Studies**

Chapters Six, Seven, and Eight report on cases studies of seven Seed Teachers. The chapters are organized by school, and each chapter starts a description of the school to provide the context for the teachers' work. A portrait of each teacher is followed by information about each one as a learner, teacher, and helper. When Seed Teachers are helpers, their roles include troubleshooter, inservice provider, and technology coordinator, messenger, and decision-maker. These roles are delineated by sub-headings. A separate section discusses each Seed Teachers relationships in the school and issues of status related to the Seed Teacher role. The individual case reports conclude with observations about what helps and hinders each Seed Teacher as he or she participates in the Seed Teacher program. Following the case reports is information about technology efforts in each school, including information from interviews with school principals and colleagues, and

the results of school surveys. Chapters conclude with summary observations about each of the Seed Teachers as they work and learn in their particular schools.

### **Case Study Organization**

Portrait  
 Learner  
 Teacher  
 Helper  
     Troubleshooter  
     Inservice Provider  
     Technology Coordinator, Messenger, Decision-maker  
 Relationships and Status  
 What Helps and What Hinders

### **Chapter Organization**

#### **Chapter 6 - Cascade Park Elementary**

School Information  
 Eloise-Confident Learner and School Leader-Library Media Specialist  
 Cindy-Focused Learner and Lab Helper-5th Grade Teacher  
 Barry-Reflective Learner and "Journeyman" Seed Teacher-5th Grade Teacher  
 Principal Role at Cascade Park  
 Colleague Reflections and Survey Results  
 Seed Teachers at Cascade Park

#### **Chapter 7 - Vintage Elementary**

School Information  
 Sylvia-Fragile Learner and Tentative Helper-1st Grade Teacher  
 Ned-Software Designer-Founding Seed Teacher-5th Grade Teacher  
 Principal Role at Vintage  
 Colleague Reflections and Survey Results  
 Seed Teachers at Vintage

#### **Chapter 8 - Lakeland Elementary**

School Information  
 Grace-Confident Learner and Efficient Leader-Physical Education Specialist  
 Jack-Computer Hobbyist and Kind Helper-2nd Grade Teacher  
 Principal Role at Lakeland  
 Colleague Reflections and Survey Results  
 Seed Teachers at Lakeland

**Notes to Chapter 5**

- 1 (Babbie, 1990; Fowler, 1993; Jaeger, 1988; Miles, 1994)

## **Chapter 6**

### **Cascade Park Elementary Case Narratives**

#### **About the School**

Cascade Park Elementary, built in the 1970's, is located in the downtown area of Cascadia and shares a campus with the school district offices. It reflects a common Northwest design; two wings of classrooms joined by a large covered play area, with an office/library complex in the middle. Classrooms open to outdoor corridors, and each four classrooms are linked together with a conference room for teachers. One wing houses the primary grades and the intermediate grades occupy the other. It is surrounded by apartment complexes, single family houses, and retail areas. Cascade Park, with 500 students in the 93-94 school year, includes the most diverse population in the district, in terms of income and ethnicity.

It is one of the four elementary schools in the district with a computer lab, and the only one in this study. Cascade Park has discussed hiring a technology specialist, who would function as physical education and music specialists do, providing release time for classroom teachers and instructing classes of students in a specialty area. By contract, Vista School District elementary teachers receive 2 1/2 hours per week of planning time, usually provided in 1/2 hour segments, with two days physical education, two days music and one day of library. The new elementary school, run by the former principal of Cascade Park, opened with half-time specialists in four areas; art, music, computers and Physical Education. This configuration is causing much comment among teachers in other schools and from specialists. The teacher association is working on the issue, but the status quo is being maintained at all of the other elementary schools.

Three Seed Teachers from Cascade Park are the focus of case studies; Barry Christopher, Seed Teacher during the 1993-94 school year, and former Seed Teachers, Cindy Rockefeller and Eloise Gallagher.

**Eloise Gallagher-Library Media Specialist****Confident Learner and School Leader****Portrait**

Eloise Gallagher has been the library media specialist at Cascade Park for five years, since earning her Masters Degree in Library Science from the local university. Fresh out of college with a degree in music, she started her career as a elementary classroom teacher in another district, before taking time off to be with her children when they were young. She spent considerable time as a volunteer in her children's schools in Vista District and had several part-time jobs as a medical librarian. Eloise was the Seed Teacher at Cascade Park from 1990 to 1992.

Eloise, in her mid-forties, is a single parent with three teenagers. She is outgoing and confident, punctuating most conversations with a hearty laugh. She has been described by district technology administrators as a good Seed Teacher and is highly regarded by her colleagues at Cascade Park. She serves on several district committees and is an elected leader in the regional library media specialist professional group.

Eloise became a Seed Teacher because "the two people who were doing it were having a tough time and they were coming to me, so I thought I might as well get paid for it." Using her yearly stipends, Eloise bought two Macintosh computers for her home, which are in constant use by her and her children. Eloise nimbly juggles many roles and activities, including parenting, teaching, personal learning, leadership in professional associations, and active involvement in whole school issues.

In 1992, she wanted to become as "literate as I can be with the technologies, to use computers for my daily work and to keep less on paper, to be more literate with multimedia, and to work with telecommunications." She also wanted "to disseminate as much of what I know as possible without sounding like somebody coming down from up high to anybody else on the staff who wants the information" and "to be as available as possible for troubleshooting." In the back of her mind, she holds the idea of transferring to another career, and she has done a little consulting on the use of computers.

Eloise describes her computer-using skills as "slightly more than enough to get me in trouble," laughs, and continues with "I am pretty much self-taught. In 1983, I took one of those *Computers for the Housebound Housewife* courses at the community college, and then bought a secondhand Commodore and went through graduate school with it. I started learning about databases and online accessibility, and used the library of medicine online."

As part of her job, she "learned about statistical packages on main frames and how to access them from home."

In the library at Cascade Park, the circulation and catalog are online. Eloise has entered much of the data and supervised parent volunteers as they gathered information to get the library online. She uses a CD-ROM database hooked to the circulation system as a cataloguing reference tool. On her teacher work station, a DOS computer in her office, she generates student lists for various projects and tracks student work. She creates charts, calendars, lists, schedules in *Excel* which she taught herself. She keeps a running database of possible new materials she could buy for the library. She hooked a CD-ROM player to a computer in the library to use as a research station, and is acquiring more research centers gradually. Eloise could not do her job without computer technologies.

As a library media specialist, much of the work Eloise does is online. She teaches children, manages the library, and acts as a consultant with the teachers. She works with students and teachers to increase their skills in using computers. She has difficulty separating what she did in her role as a Seed Teacher and what she did as a librarian. Eloise thinks the Seed Teacher job was a perfect fit because the responsibilities were so intertwined. As a specialist who works with all of the children and teachers, her perspective is broad.

### **Learner**

Eloise believes the Seed Teacher role to be a learning one. "The idea is that Seed Teachers will get some training and they will help other people that need help. They start out with not necessarily a great deal of technical knowledge, but it increases and the knowledge that they get from the District training, they can disseminate to the staff." She sees the role as developmental, "to take neophytes and build them up to where they are more confident. I've certainly learned more through troubleshooting other people's problems than I ever thought I'd learn anywhere else. You're forced into a situation of having to learn, basically."

Eloise was interviewed in 1992 and again in 1994. In 1992, she liked "learning, feeling competent in this area myself, and being able to use what I learn in my job every day and at my home, too." In 1994, Eloise looked back on the experience of being a Seed Teacher and reflected on what she liked, "I think the best part about the Seed program is that, when you are the Seed Teacher, you are forced to learn about things that you never would have thought you'd ever learn, both in how you deal with different personalities and

how to deal with technological trouble shooting. I wish that everybody would take a shot at it, because I think you learn a great deal."

### **Teacher**

Eloise also believes that being a Seed Teacher improved her teaching and benefited her students. "The kids have the opportunity to reap the benefit of your new knowledge. And you're not so afraid. The students get teachers who are capable of teaching them more about the equipment and about the programs, and they get teachers who are excited about where things are going and how to get there. They get the benefit of trying new ways to do old things."

Eloise believes that the Seed Teacher program is partly responsible for all student use of computers, because "the teachers wouldn't be as willing to teach computer skills if they didn't have training themselves. And they wouldn't get about half of the training that they've got without the Seed Teachers, with either the individual Seed Teachers getting their own training or giving inservice to staff." As she thinks about her colleagues and how they use computers to help students learn, she sees that "as the Seed Teacher program evolves through the ranks of the staff, I see more and more buy in. I think that the buy-in issue is important. It kind of gets everybody on board going in the same direction, if not at the same speed."

Eloise adds more pieces of technology and more activities to the library each year. Since being a Seed Teacher, she has retained her status in her school as a leader in teaching with computer technologies.

### **Helper**

Seed Teachers take on roles of generalized helpers in their buildings, acting as troubleshooters, inservice providers, technology coordinators, messengers, and decision-makers. They help individuals with computer problems, conduct inservice sessions for their colleagues, and give presentations and updates at staff meetings. They act as conduits for technology issues between the school and district administrators, work with the library media specialist on inventory of hardware and software, and participate in or lead the building technology committee.

Eloise marries the ideas of learning and helping. She learns because she helps. For her, it is one idea. "The metaphor of the seed is very good, because we are the seed that is

planted in the staff. It grows for you personally. Your own knowledge grows like a seed grows. And you're disseminating it to other people too, so the knowledge of your staff as a whole grows because of what you've been learning. So its kind of a blackberry situation when it works. I think I've seen that here, where my own knowledge has increased and there have been lots of little underground runners. I would say that it is growing better in more fertile ground (laugh) than on rocky soil. Some people take the information and are going leaps and bounds. Others are getting exactly the same amount of time, exactly the same amount of effort and are real slow to take off, for whatever reason."

### **Trouble-shooter**

Eloise describes her duties as a Seed Teacher this way: "whenever something crashes or won't work or the printer won't print or whatever, it's my job to figure out why, if I can. I would say that's my biggest one, is the troubleshooter, trying to solve the problems before we haul in the big guns."

In her role as a library media specialist, Eloise thinks about the whole school as her arena of concern, whereas the classroom teacher usually focuses on the classroom. As she looks across the school, she sees benefits and drawbacks of the Seed Teacher program. On the positive side, she lists the personal learning for the Seed Teacher and the continuing helpful position they play in their schools. As a trouble-shooter, they are "the first line of defense." Eloise believes that the small amount of money paid to Seed Teachers is worth it because of the value of having someone in the building. "Sometimes people are more willing to listen to things when its done in a peer coaching manner rather than 'I am the expert, I am telling you what works'. Seed Teachers form kind of a backbone for the district, that they can call on for help." Eloise knows that her colleagues value familiarity and ongoing access. "I already know them and we already have a relationship, so I'm not coming from on high. They already know I screw up plenty. They know that I'm not just there today. I'm here next week, I'm here next month. If they have a problem, they can come."

A downside of the Seed Teacher model for classroom teachers and Seed Teachers is finding time and energy to work together on problems. When the Seed Teacher can solve a problem is not necessarily the same time when the classroom teacher can watch and learn. Eloise tried to find the time to "walk through it and talk them through it. You go fix it and then it's done ...until next time that it happens again and then you go fix it again and ... it's like giving them a fish or teaching them how to fish." Eloise worries about adding to the already heavy and stressful load of classroom teachers. "The teachers already have a very

full schedule and a very full day. They don't have anything left at the end to do more trouble shooting, more thinking about what materials they should be getting, more designing of instructions and more, more, more, more, more, more, more. I always felt like I was kind of putting out fires most of the time, instead of fire-proofing the house to start with."

### **Inservice Provider**

When the teachers first received their computers, Eloise set up a little mini-lab with computers loaned from classrooms, and conducted after-school inservice sessions two days a week for three months. Several staff members described these sessions as important events in the technology development of the school. All of the succeeding Seed Teachers measured themselves against the mini-lab sessions conducted by Eloise. Eloise was never quite sure where the line was between her responsibilities as a library media specialist and a Seed Teacher in a building acquiring more and more technologies. The combined roles seemed natural to her. One of the roles recommended for library media specialists in national library guidelines is that of staff trainer and resource person. The inservice provider part of being a Seed Teacher was a big step for Eloise, but one she was eager to take. "I enjoyed teaching the staff classes. It's opened up some new avenues for me as possibilities that I've never really thought about before. Because of the things that I've learned, I've done some consulting in various places."

Teaching her fellow staffers was an eye-opening experience for Eloise. "I did feel like I was doing something in a positive direction when we set up that little mini-lab. It was neat. But I'll tell you by the end of it, I was so aggravated with teachers that would come to these things and not listen. The hard part about it was that everybody was on a different level and everybody wanted to do different things at different times. They were your nightmare class come to life. They're awful ... teachers are terrible. I just could strangle them. They are so anxious to get into it and learn it their way. And yet they want to be saved. I wanted to say, 'get your own lifejacket, kid. I'm through with you.'" All of the teachers in the study were reluctant to say anything negative about their peers, and yet they had some colorful reactions to the experience of helping and seeing fellow teachers in a different light.

"Teachers do learn well by playing with it. I think kids learn well by playing with it, and I don't think it's any different for grownups." Perhaps because of her role as a specialist, Eloise steps back and observes her peers as a group. She is opposed to inservices which hand teachers ready-made notebooks of lesson plans. "I don't think that

works real well. Unfortunately that's kind of what overworked, harassed teachers are looking for, the recipe method. 'Give me a set of job cards and I'll do anything.' Lately, I've been seeing teachers do a lot of different stuff." Eloise is critical of teachers for wanting easy pre-made solutions but she is more generous in her regard for them as learners than are most of the other Seed Teachers.

As a librarian and Seed Teacher, Eloise took the lead in her school for introducing students and staff to computer uses. She liked teaching the teachers because it represents another career path for her, but she was surprised and exhausted by their behavior. She does not connect their behavior in learning to use computers with the behavior of students in a similar situation.

She considers it very important that Seed Teachers work in the building and do not come in for one-shot workshops. "I always liken it to somebody who comes in like a favorite uncle, diving into the family, tickles everybody and gets the kids so they're all running around the house screaming and then says "bye", leaving you with the mess. The district doesn't have to do it that way. They don't have to hire somebody from outside to come in and get everybody all psyched up and then leave when the money runs out."

### **Technology Coordinator, Messenger, Decision-maker**

In addition to troubleshooting and offering staff inservice sessions, another Seed Teacher duty at Cascade Park, as at other schools, was making technology decisions for the building. "It's a scary thing, Seed Teachers listen to what people want, and they make the decisions on what to buy." This made her nervous when she did it and it makes her nervous now. She tells what can happen, "When we first got those Macintoshes, everybody was squawking and screaming that you'd better get screen savers on those computers, so that the monitors didn't get etched." Eloise and her partner bought screen savers for every computer. "Almost the day that we had installed them, Frank (the district technician) came by and said, 'Gosh, you really don't need screen savers with color monitors.' We were very angry because we hadn't had anybody to talk to about it." Eloise felt like she was out on a limb without support. "The administration knew less than we did. And the teachers didn't want to know. They just said, 'do it. You take care of it. We don't have time.' So we did. And it was a bad move." Eloise likes being in a position to make decisions, but she wants to be supported with information.

Both as a Seed Teacher and as a library media specialist, Eloise felt her job included "keeping track of where the equipment is and who's got it." She also filled a messenger role, transmitting technology information to the school. "The Seed Teachers are sort of the

conduit by which the TEK people get their message eventually through to the rank and file." As a helper in her school, Eloise worked with teachers individually, troubleshooting problems and she worked with them in groups as a teacher. She led the technology committee and made technology decisions for the school. She believed that the helper activities she did increased her status and influence in her building.

### **Relationships and Status**

Being a Seed Teacher, caused Eloise to reflect on her status in her building and in other arenas. She feels that being a Seed Teacher improved her position with many groups. "For one thing, I think that people on staff see me as kind of a technological guru ... which always makes me laugh! But they see me as knowing more about technology than they do, and they look up to that. They appreciate it. And I don't know if I would be anything much more than the book lady otherwise." In many schools, librarians are perceived as high-paid book clerks or as baby-sitters who look after groups of students to provide teachers with some planning time. Eloise noticed a difference in her relationships with colleagues after helping them with computer issues. "I could help them on the computers, therefore, I could help them other places. When they see you as being capable, they kind of take you more seriously." She felt that her relationships with principal, Pauline was "more collegial and less 'she's the boss, I'm the flunky.'" With Tom, she is a major player in school decisions. With students, Eloise found "there are some that take me more seriously. They think, 'This is the lady that has information about stuff that I want to know about. And, you know, she's not just the librarian.'"

Eloise was sensitive to relationships between district technology administrators and teachers in school buildings. "Sometimes, TEK gets to breathing kind of rarefied air and ... and they see themselves as separate from everyone else." More than the others, Eloise works in several arenas and thinks about the ways people relate to one another. Eloise felt slighted and not taken seriously as a professional in some of her dealings with the Technology Director. She did like being in the district-wide group of technology leaders and enjoyed meeting with teachers from all of the schools. She formed her own informal network of Seed Teachers to call for help on specific problems.

### **What Helps and What Hinders?**

For Eloise, the main incentives to participate as a Seed Teacher were the computers for home, the opportunity to learn, the recognition in her school, and the compatibility of her job and the role of Seed Teacher. Many of the responsibilities related to computers and software in schools are shared between librarians and Seed Teachers, with differences from building to building. She designed the inventory system for computer technologies in her building and implemented it. It worked for her to have the perks of being a Seed Teacher along with the hard and tedious work. Eloise believes it is a fair trade to exchange service to her school for computers, training, and educational opportunities.

Eloise started the job with a high level of skill in using online data sources, and working online from home for the hospital and university. She had an everyday understanding of the use of computers in the work world that most other teachers did not have. When she came to work at Cascade Park, she had also just completed her Master's Degree in Library Science at the local university, so she had a personal knowledge of work in modern libraries. Being a Seed Teacher allowed Eloise to share her expertise with fellow staff members in a specified, designated role. The lack of specific expectations and the unclear evaluation of the program were helpful to Eloise. She created her own structure for the Seed Teacher job and carved out a large, distinct role for herself in her school.

Eloise said that the major impediment to doing her Seed Teacher job was lack of time. Eloise wanted to help more and learn more. Because she is a single mother who is very involved in her children's activities, Eloise regularly spent long afternoons at school, but rarely committed evenings or weekends to the workplace. It was important to her to have computers at home, for her personal work, and to contribute to her children's learning. She felt successful about her own accomplishments, but felt that the Seed Teacher role is a difficult one for most classroom teachers. "The drawbacks and limitations are that these people still have to be responsible for their own classes and their regular jobs. We all know that teachers already have plenty to do, and to add something more on top of it is kind of a herculean task. Who knows what gets dropped, but something suffers, in order for you to have time to do this kind of thing."

Eloise is the only Seed Teacher to mention friction with her partner. While she had a compatible and productive partnership with her first partner, she had a hard time working with Cindy. Eloise felt that Cindy focused too narrowly on her own learning and her own classroom, and did not see the big picture. Eloise recognizes Cindy's contributions to the school, but does not relate well to her personally. Eloise was also sensitive to issues of

equality and professionalism. She resented being talked down to by the technology administrators. On balance, Eloise thinks her term as Seed Teacher was a time of tremendous learning for her and very positive for her colleagues and school, as well.

### **Cindy Rockefeller-5th Grade Teacher**

#### **Focused Learner and Lab Helper**

#### **Portrait**

Cindy Rockefeller, fifth grade teacher, is an outgoing, wise-cracking woman of about fifty years. In a television sitcom, she would be cast as the waitress in a roadhouse cafe; boisterous, funny, and outspoken. She is in her fourth year at Cascade Park, and has taught in Vista School District for 16 years. She started her career as a physical education teacher in California, but has taught mostly fifth grade at several Vista schools. She was a Seed Teacher at Cascade Park from 1991 to 1993. She apprenticed with her first partner, Eloise, and guided her second partner, Barry. In the first year of her term, all teachers received their computer workstations and began to use them, while she and her fifth graders continued to set up and maintain the old Commodore student computer lab. The district plan was for schools to slowly acquire student work stations over the life of the technology levy, but she and her principal convinced the superintendent to advance money from the technology levy to buy enough Macintosh computers for a lab. Cindy ordered the computers and software, unboxed and set up the lab, and considers it her biggest achievement.

She became a Seed Teacher because she really "wanted to learn the computer and that's the only way I learn things. I'm a self-motivator in the sense that I'll take classes. But I'm not a self motivator like I'll sit down and read." She proposed to the principal that she be the Seed Teacher, "because no one wanted to volunteer, I said, 'Do you think I could do it?' Meaning, I didn't know if I could do diddly. Pauline needed a person that would be the Seed Teacher. And I just knew nothing, but I have always had the ability, real good classroom control and rapport, I knew I could teach my fifth graders how to boot those puppies up in the morning."

Cindy's is a conventional teacher-centered classroom, characterized by whole group lecture and recitation and individual seat work. It is a room in motion, full of talk and movement. Cindy talks continually, maintaining an overtone of directions to the whole

class and an undertone of specific corrective, and often sarcastic, comments to a variety of children. When students are working on art activities or projects, they seem engaged, but during read-aloud time or seat-time assignments, many students are distracted and off-task. Cindy is very frustrated with her class, and their lack of interest and skills. She refers often to the great group she had the previous year.

When Cindy came to Cascade Park, she brought two computers which her previous fifth grade class at Lakeland had won. She had not learned to use them. She says, "When I came to this school, I couldn't turn the darn things on. My ex-husband would sit down, and he's so darned smart and gifted, he didn't want to be bothered with me. He would just laugh at me, so I never felt comfortable asking. But now I do feel comfortable. After four or five years, I'm not saying that I've mastered it, but I feel comfortable. And I can talk to the kids and not feel like a total illiterate." She describes her computer-using skills as "S+. I've got things I could learn, but at least I can learn them. I'm learning to use my *'Tools'* and I want you to teach me to use my *'Scrapbook'*. I took the Internet class. I am getting *Prodigy* at home so I can write to my son."

Cindy is improving her skills at word processing and likes to print out letters because "they sound educated." She loves learning about the computer and has worked at it. She says "things overwhelm me and I get frightened and I think I can't do it. Once I get into it, I can do it." Daily, Cindy instruct her students and her partner Lee's class in the computer lab. She teaches them keyboarding, with some choice time on Friday's. Because she instructs in the lab with two classes a day, and because she is so associated with the computer lab since setting it up, Cindy is perceived by students and teachers in the school as a knowledgeable computer user.

### **Learner**

Cindy became a Seed Teacher because she wanted to learn how to use computers and she believed that classes would be available to her as a Seed Teacher. Her language about computers and learning is emotional and relational. She compares herself to others in terms of her learning and she is proud of her achievements. The Seed Teacher Program gave her a chance to become "so involved. Like college classes, it's another opportunity to learn." Cindy thought about her confusion in the beginning and the way she feels now, "It was like another language. I had no idea I would catch on. I was still a little fledgling. Now I think there's nothing you can't do with it. It's like opening another world."

During the year of the study, Cindy worked with a particularly challenging fifth grade class. She was discouraged about her work with them, even though she took a generally positive view of working at Cascade Park and being a Seed Teacher. For three of the four interviews, Cindy was enthusiastic, talkative, and upbeat. She described teaching at Cascade Park as wonderful, supportive, and harmonious, and feels she is able to buy things and work in a pleasant atmosphere.

During the third interview, Cindy was sad and cynical because she had just come from a contentious meeting with her principal, Tom. When I asked her to think about schools in the future, she talked at length about changes in schools and in the country as a whole. She feels that reforms come around and around, and that classroom teachers are not appreciated. She thinks in ten years we'll be doing the same thing because "everything goes around. A few years ago, everything had a structure to it. Now its completely different." Cindy discusses how she personally learns new methods or teaching ideas, "so maybe I just take a little bit of it. Kind of incorporate it, you know. But I just don't like to throw everything out, but a little bit of it." She considers herself a conservative teacher being asked to teach in new ways, so her answer reflects this belief. She thinks schools and teaching will be exactly the same for many years.

Whenever Cindy talked about being a Seed Teacher, she became animated and positive. When she was a Seed Teacher, Cindy "felt more important." She also "liked the idea that we learned a lot and the door was open and we got to teach. We got to learn a lot of the new...what was really coming. I just thoroughly enjoyed it." In the interview in which Cindy was depressed and negative about schools in general, I asked her what she considers to be the drawbacks of the Seed Teacher program. She was emphatic. "I didn't see any drawbacks. I just couldn't suck in enough knowledge. I wish I could just put it in my ear and just (whoosh), suck it all in. I didn't see any drawbacks. I really enjoyed it." Cindy answered this question as she did most of them, in terms of her own learning and desire to increase her skills. She also answered most questions in a way that was specific and focused to particular features of computer use or learning to use a piece of software. Cindy's conception of computer technologies is that of a finite body of knowledge to be learned once and for all.

Cindy has integrated the use of computers into her daily functioning and teaching, so much so, that it was a prime reason she did not move to a different school. Cindy holds principal Brad Hardy in the highest esteem and when a position opened in his school at the end of 1994, Cindy was tempted to apply for the job, especially after her run-in with Cascade Park principal, Tom. However, Brad's school has a lab filled only with Apple

IIGS computers and Cindy cannot imagine working with them. She loves working with the Macintosh computers in the lab she set up and thinks it would be like going back in time to work with the Apples. She is making career decisions based on the kind of computer she wants to use.

Cindy believes that being a Seed Teacher helped her personally. "I have done a lot more. I think I'm a lot more skilled around people." Being a Seed Teacher increased her self-confidence. She took on what she considered to be a huge challenge and succeeded. "I sure don't think it's an easy undertaking. I'm not anything great, but I'm much better than I was." Cindy gained enough confidence in herself as a learner to buy a digital camera, desktop publishing software, and search for and hire a personal tutor to teach her to produce her own newsletters at home.

Over and over, Cindy says she learns best in classes. When asked to design the perfect program to help teachers with computer technologies, she is clear and decisive. "Well, I would start with really good computer lab." Cindy's idea of perfect staff development for computer use, would be for a skilled instructor to teach formal classes to groups of students with their teacher in attendance. "Have it as an absolute requirement that the teacher and the students come to class, and the teacher learns right along with the students. And then after two years of once or twice a week, I think then that the teacher would be able to take off on her own." Cindy thinks about how she likes to learn and she describes her ideal way for the lab to be run. "I need everything, starting with 'A' all the way down, black and white." Cindy has described an environment in which she would like to learn and to teach. She assumes without hesitation that it will work equally well for all teachers. Cindy's idea contains the notion that a set amount of training will bring classroom teachers and students up to some standard. She clearly feels that she has achieved this standard by taking classes and problem-solving in her school.

## **Teacher**

At Cascade Park, the Seed Teachers run the computer lab. This is also the expectation in two of the three other elementary schools that have computer labs. While the care and maintenance of the computer lab is part of the helping role for Seed Teachers, in Cindy's case, she involved her students. In her first year as a Seed Teacher, her fifth graders got the Commodore lab set up each morning and were the troubleshooters for the machines. "They'd work a month at a time, coming over every morning, they would pick up software for the day's classes, and get them started. Then I would get new groups, and

one person from the old group trained the new group. And they did a wonderful job. They knew more as far as the Commodore than I did."

Cindy pushed to create a Macintosh lab and took primary responsibility for maintaining it. Since her term as Seed Teacher ended, she has continued to take considerable ownership of the lab. She regularly works in the lab, trouble-shooting on the equipment, and installing and tinkering with software. She has worked out an arrangement with a fellow fifth grade teacher who teaches her students math, while she teaches his students keyboarding and computer use in the lab. They trade students daily for a half hour period. When I observed her teaching in the lab, the typing instruction consisted of her reading letter and number sequences while children typed them. Most of the screens filled up with line after line of symbols, but the children in my sight were not keeping up with Cindy or typing exactly what she said. Cindy typed while she called out the sequences. After 20 minutes, she went from computer to computer to inspect the work. Students casually conversed with each other during this time as they awaited their review. During the half hour in the lab, Cindy talked continuously, calling out numbers and letters, correcting behavior, encouraging students to keep going, sit up, and place their hands correctly on the keyboards. On Fridays, students work on software of their choice.

Cindy likes teaching in the lab. "I like using the overhead and the PC Viewer...I like showing kids." She believes that being a Seed Teacher helped her as a teacher and that other teachers will also benefit if they take on the role. She sees it as an opportunity to "buy a computer" and "teach kids." Cindy hopes to work with students and computers in the future as she is close to retirement. "I'd love to be a consultant. Run a computer lab. Now that to me would be Christmas candy. And do it half-time. I'd love to do that. That to me would be wonderful."

Students in Cindy's classroom use the classroom computers continuously for writing projects and simulation games, like *Oregon Trail*. She encourages students to learn more than she knows. Cindy uses her computer to prepare materials for students and feels that this makes her more professional and makes the materials more interesting to students.

## **Helper**

In her helper role, Cindy helped teachers with computer problems in their classrooms, and she conveyed information to the staff about technology issues. She operated the Commodore lab during her first year, and then worked with staff in her

school to get the Superintendent to front-load money to the school to equip it with a Macintosh Lab, which she set up and maintained.

### **Trouble-shooter**

Cindy says, "if a teacher needed help, we'd go and we'd help. I would call somebody that could help me, teach me....and then I'd try to problem solve and then go in and help them." Cindy likes helping and describes herself as "kind and conscientious and empathetic." She liked "letting others see that side" of her. Cindy said, "People complimented me. Made me feel good."

### **Inservice Provider**

Cindy thinks of the Seed Teacher program in a straightforward way. If you "teach a person, they will teach others." At one point in her generally positive comments about working with her peers, Cindy reflected on the learning of some of them. They acted like they did not "want to help themselves." Cindy was working hard to learn and she did not exhibit much patience in retrospect with some teachers she viewed as resistant. Cindy enjoyed teaching a couple of inservice sessions when Eloise organized the mini-lab and scheduled sessions.

### **Technology Coordinator, Messenger, Decision-maker**

Cindy feels like she is the primary person who got the lab for the school and that she should be highly regarded for all her work. Because she personally ordered all of the equipment and physically set it up, she considers it to be quite an achievement. She and Barry worked through many issues as they set up the lab, got it running, bought a security program so students could not alter the programs, and scheduled all teachers into the lab on a weekly basis. It was extremely time-consuming and Cindy invested many evenings and weekends.

Cindy liked researching possible programs for the lab, buying them and getting them installed. She continues this activity with grade level funds, but misses having a role in all-school decisions. Seed Teachers at Cascade Park made decisions after informally canvassing staff. They worked without a technology committee or oversight group of any kind. Cindy thinks it worked fine. Because Eloise took a continuing role in whole-school technology leadership, Cindy was able to focus on the lab and her own learning and teaching.

## **Relationships and Status**

When Cindy had a negative run-in with her principal, Tom, the year after being a Seed Teacher, she "was really hurt" that Tom suggested she might transfer to another school, and said " It didn't matter that I did a lot. I give everybody else a lot of credit, but I did a heck of a lot, in getting those computers...and doing set up and running over here. Any time there was a problem, I personally went over to Joanie Land and asked her. And I really did a lot." Although she patched up her relationship with her principal, it is interesting that she discussed her worth to the school in terms of work she did as a Seed Teacher. Cindy and Barry point to the lab as a concrete artifact of their tenure. Cindy's accomplishment in getting the Superintendent, Sara Brand, to forward the money for computers and her personal satisfaction in physically setting up the lab and getting and keeping it operational, are the base on which she evaluates her performance.

Cindy is sensitive to relations with fellow staffers. She comments frequently on her relationship with principals. She intensely dislikes the principal at Lakeland who transferred her out of the school, but she worked hard for Pauline and was very positive about Tom, before their critical meeting. She is more tentative now in relation to him. She describes herself as "dedicated and wanting to do well." Our last interview took place in the computer lab at 6 p.m. on a Friday night, as Cindy installed a program on all of the computers. Cindy lives alone and she is willing to devote many hours to the school if she feels like she is appreciated.

Cindy is perceived differently by her Seed Teacher partners. Eloise is critical of Cindy because she focuses so much on her own classroom and her own learning. This view was not shared by Barry or Shelley, who speak positively about Cindy's contributions to the school. Cindy was a Seed Teacher in her second year at Cascade Park and it was a way for her to establish an identity and meet people. She is proud to have been a Seed Teacher, because "people go to them. They have a positive effect. I learned a great deal." Cindy counted a lot on Eloise. It has been proposed that there be only one Seed Teacher in a building, but Cindy cannot imagine doing the job without a partner. "I needed a lot of help." She would not have done the job alone, because "I didn't know anything about it."

## **What Helps and What Hinders?**

Cindy likes the design of the program and she reacts negatively to the thought of changing it. She reacts with the frustration formed from many meetings about school reform and change. "I'm just hanging on by my teeth. People always want to redesign or they always have these ideas of how to change things. I've always been the kind of person, I just say, 'Gee this is great!' It worked really, really well for me." The program worked fine for her and the school and she does not want to change it. Cindy loved getting a computer and going to classes to learn to use it. She believed that she was helping people and could point to specific instances of help to individuals and what she did to help them. She knew she was trying and believed people saw her effort. The main incentives for Cindy were the computer for home, classes, a partner to work with, and increased status with her peers.

Everyday as Cindy walks into the computer lab with groups of students, she is surrounded by the fruits of her labors. She considers the lab to be her personal achievement and it is continually rewarding. The lab of Macintosh LC's is considered problematic by the technology administrators, because the early model computers will be too costly to connect to the district network. Buying early-model computers in large numbers was not advised by the district technology experts. Although it was done to address a perceived inequity, it actually compounds the inequity by saddling the school with 30 older stand-alone machines. None of this information seems to be known by the school members or Cindy, or factored into her awareness of her accomplishment. Other staff members regard Cindy as the person who got them the lab and they are positive about it.

If Cindy were a Seed Teacher this year, she might not be able to contribute as dramatically, as the lab is up and running, and the staff as a whole know more. With her focus on the lab, she has created an ongoing role for herself in the school.

### **Barry Christopher-5th Grade Teacher**

#### **Reflective Teacher and "Journeyman" Seed Teacher**

#### **Portrait**

Barry Christopher, age 41, speaks softly and manages her fifth grade class at Cascade Park with a calm and friendly authority. She teaches an integrated class which

includes students who are classified as needing special education services as well as those who need regular education. A teacher for 17 years, she worked for 13 years at Mountainside School, a school for incarcerated youth run by the Vista School District and has been teaching at Cascade Park for four years. She teaches with the unflappable and humor-filled manner of a person who has spent many years working with delinquent children. In the spring of 1994, she was in the concluding semester of her two-year term as Seed Teacher. Her partner the first year was Cindy Rockefeller and for the current year is Shelly Thornton. Her classroom is orderly and she rarely raises her voice. Students are led through group activities or work on their own in small groups or individually. Desks fill the center of the classroom, facing forward toward the chalkboard. On the window side of the classroom and in the back are two computer workstations which students use.

Barry became a Seed Teacher because she wanted to push herself to learn more. Her husband is a computer expert and even her young daughter is a tester of software at a local company. She said "it was a good opportunity for me just to go ahead and jump in and do it. Because I knew I probably wouldn't or it would take me a long time if I just kind of kept saying, 'Oh, I'll do it later.' But if I had to do it, if I was under pressure to do it, I would do it. So I did. Being able to get a computer again for home is really a nice carrot. We got a good machine, a 486 Genesis (DOS)."

The goals Barry set for herself were to help people understand "how the computers can best fit their needs. And also just make sure that the computer lab is up and running so that everybody is on board. I want to help them find the programs that they need and find out if we have funding for them." In assessing her progress toward these goals, Barry said she is "failing miserably" at helping teachers understand about computers. She is proud, however, that everybody in the school goes to the computer lab weekly, except the kindergarten classes, who go occasionally. Fifth graders use the lab for a half hour a day, and the other grades use it for 45 minutes weekly. About her goals, Barry thinks she has made them "about 50% of the time."

Barry describes her computer-using skills as "just a little bit above beginner. And it will probably be a little bit above beginner forever." She and her husband have been married nine years and they have had eight computers. When Barry starts to figure one out, they get another. Barry is proud to have contributed the last computer to the family. She works with Macintosh computers at school and DOS computers at home. Her husband is an expert user, and Barry compares her skills to his. Barry's language regarding computers is much more hesitant than when she talks about other aspects of teaching.

Asked about using computers in her teaching, Barry responds with "I don't do as effective a job this year. Last year we did a lot more. We learned the computer home keys. In the lab, we're starting to learn the *Writing Center*. They also worked really closely with the second grade teaching them *Kids Works*. Its a little bit tougher with this group this year. There's maybe three to five who are very responsible, depending on the day." While most of her class takes orchestra lessons in the morning, the remaining eight kids use the computer lab. She doesn't approve of her own practice, but she uses the lab time as a carrot so they'll get their work done. Students use her teacher workstation to do their reports and play a simulation game, *Oregon Trail*, when they have extra time. The scheduled daily lab time is used mostly for keyboarding and beginning word processing. Computer use is peripheral to the minute-by-minute activities of students each day.

### **Learner**

Barry understands the Seed Teacher program to be a learning program, "Teachers may or may not know anything about computers, but it's a way to get them involved and to help other people learn about computers and to help troubleshoot a little bit, and get hold of the technician or Joanie. It's also a way of funneling information from the District to the rest of the school. They are given specific duties to try and get a little more computer oriented. This is a specific job to help try and get schools more computer oriented." Barry, like her co-workers at Cascade Park, hopes all teachers get to be Seed Teachers. "Everybody should have the opportunity. It doesn't matter whether somebody is the absolutely best Seed Teacher in the whole world and another person is seemingly maybe the worst, I think everybody deserves an opportunity because they need it."

Barry likes being a Seed Teacher, and is both anxious and excited about learning. "I like working on the computers. I like different programs. I like the challenge. I like learning about different things. And I like watching kids learn. I like watching adults say, 'hey, I got it!' and get really excited. I like the excitement of the learning. It's like being back in college and finding new theories or something about why something worked. Or watching a boy that you thought couldn't even talk, all of a sudden, talk!" Learning about computers is an emotional investment for Barry. She expresses her feelings of difficulty, when I ask her to describe the Seed Teacher program with a metaphor. Without pausing, she said "Oh, it's hard. It is kind of like swimming up river sometimes. Sometimes you can go down a side channel and it goes real smoothly, and most of the time you're kind of struggling to find out what's going on. And how to correct it." Barry observes herself. "I

start off slow. I learn faster if it's important to me, and if I am using it. If it's relevant to what I'm doing and I don't understand it, it makes it a lot easier for me to keep learning, because I understand why I need it."

Barry never mentions having any trouble understanding the Macintosh computers at school, but she continually references her difficulty in learning to use her DOS computer at home. "I never have felt confident with machines. Like with our IBM at home, I wouldn't even touch it. We've had it two years and in the last few months, I've gotten into it and tried things." The computer Barry is referring to is the one she bought with her Seed Teacher money. There are only a couple of DOS computers at her school and she bought the computer both to learn how to use it and to provide a good computer for her husband and child. Barry is proud of herself for learning to use the DOS computer, but she is doing so at the end of her two-year term of service. She gave herself an extra challenge by buying a different computer for her home than what she uses at school. If she wasn't spending so much time just trying to get it to work and to print, she might have been working on lessons or more creative projects.

Barry is a sure-footed teacher, but a tentative learner with computers. When Barry talks about learning to use computers she says she is slow, not technical, and she worries people will know how dumb she is. Comments like this are puzzling from Barry and stand in contrast to her confident language regarding other areas of teaching and learning. She is an assured teacher, and is comfortable with her students, parents in the classroom, and other staff members. She is more a listener than a talker. In her classroom, she is completely in charge, with the classroom running smoothly, and Barry aware of what is happening in all sectors and controlling the scene with expectations, clear structure, and quiet tune-ups. The amount of negative self-talk and fears which emerge in the interviews are surprising when compared to her on-the-job competence. Three of the interviews were conducted in her home, with the two little children interacting off and on with Barry. In this setting as well, Barry was relaxed, confident, and in charge. Barry is especially hard on herself as a computer learner, because she always compares her learning and skills to those of her husband.

## **Teacher**

Barry thought that computers were going to teach children. She talks often from a reference point of computers as teachers, learners in isolation, and an all-digital world in schools. "Computers are good learning tools, but it still involves a lot of discipline in

teaching it. And it involves a lot of discipline in the students learning it, in that it's not something you can just set the kids loose on and think that they're going to learn it. It still comes down to teaching. You have to go through the correct steps and some kids will learn it faster and others will learn it a little slower. And some will want to fool around and do whatever they want on it. And some will follow the program, so that they can get the end result. So it's the same teaching, but it's just a different medium." Barry refers to teaching computer skills as if it were a particular course of study.

"I thought that I would be able to do it, but I didn't think that I would be able to teach it. I was thinking that students would end up teaching me. Barry likes puzzling through the addition of computers to the classroom. "It's helped me to teach problem-solving skills. It's made me think it's more important than anything else. That's how I judge whether I'm teaching or not."

In drawing the Seed Teacher program, Barry drew a computer at the center and related various things to it. "I kind of see it as everybody being able to use it and the kids being able to have time on it and to learn and be comfortable with it. To also learn some responsibilities with it. And I see it as a teaching tool for teachers and then for teachers to pass on to the kids. Student, teacher, training. The training filters down to the teacher and the student. Seed teachers pass on what they've learned as much as they can. Then I think the teacher passes it on to the student to the degree that they can. Or gives the student the opportunities. I think that all comes down to opportunities. For everyone."

Barry speaks at length about teacher comfort level and the use of computers in schools. She references the different views she sees between the central office administrators and teachers in school. She comments that teachers need to know how to use what they have, and points out that they are not excited by the same things that are touted by technology advocates. "It's like flying a plane, you know. Some people just want to fly two-seater planes, and not aspire to be a 727 pilot. Or some people just want to go out and snorkel and not belong to the Underwater Seals." Barry and several other Cascade Park teachers spoke defensively about technology, articulating a view that schools were going to be dehumanized by the introduction of computers, and that computers would replace teachers. They said that they resented all of the positive press about Vista School District technology projects, because it made parents expect more from teachers.

The three Cascade Park Seed Teachers express similar feelings about the expectation that they be super-users of computers and a fear that computer use will push out other activities of value. "The District office is still thinking that people are lazy because they haven't learned everything that they need to know about computers. And they

just forget that there's a few other things that they are supposed to be doing, rather than just working on computers all day." Barry has obviously heard that she and other teachers are expected to be further along with technology than they are.

Barry has thought hard about the benefits and drawbacks of using a specialist for technology integration in elementary schools. She is drawn to the idea, but feels it would have negative consequences ultimately for her and the students as learners. "I think it becomes a specialized thing, where one person is in charge of the computers and you depend on that person to do it all. Just like with PE and music, which is OK, because I wouldn't want to try and teach PE and music." If there were computer specialists, "I'd probably just leave it up to them to be teaching the kids, and I would lose something in my training that would be pretty valuable. I would like to have a computer specialist to help pump that up a little bit more, but I think people being in the Seed program is an opportunity that most everybody should have."

## **Helper**

### **Troubleshooter**

As a helper to her school, Barry says her duties are "making sure to answer people's questions. If I can't answer them, I make sure that they get forwarded....make sure that people are happy and that if people have questions in the lab that they are answered." A big part of her job is making sure the lab is operational, and she feels badly that the lab is not maintained to better standards. "The lab is another issue with me. Because it gets so dusty and dirty and there's no time to clean it ... as often as we need to, and make sure that everything is updated and to check that things are cleaned up on the machines and that the programs are where they're supposed to and running the way they are supposed to and ... and things like that are real frustrating." In discussing the drawbacks in being a Seed Teacher, Barry spoke in a troubled rush of words, listing off all of the jobs she wished she had done. After taking a pause and listening to herself, she concluded with, "but it's a trade off. I think the good things outweigh the bad things."

Barry's advice to new Seed Teachers sounds like she is talking to herself. "Don't be afraid of whatever you don't know. And just not try to absorb everything because you might feel overwhelmed. Try and take what is relevant to you at the time, and move on from there. And then if things do become overwhelming, just sit back and restock and see what is really important. Do what you can do even if it's just a small thing like trouble shooting, or maybe just finding out who has information. Don't "be worried if people dig in their heels and say, 'well, that will never work,' or 'I'm so frustrated I don't want to use

this machine '... just kind of keep working with it and when they're ready, then be ready to help them."

An issue for Barry is looking or sounding stupid. She says that working on computers has pushed her to get past this fear. "I don't think that bothers me that much any more. This program has made me less worried about my competence, because it doesn't really matter, as long as the job gets done." It is noteworthy that a person so self-assured and competent in the classroom would be so nervous about working with her peers and so concerned about them thinking ill of her.

### **Inservice Provider**

Barry lists things she should be doing but is not, like putting on classes, getting experts in to speak to the staff, and sharing information from all of the seed meetings. Barry admires the mini-classes Eloise conducted, but says, without much conviction, that teachers probably have enough opportunities for learning out of school. Barry regularly tends to teacher questions and needs in their classrooms, but does not consider this to be inservice. She wishes she could share all that she is personally learning but has not done so.

### **Technology Coordinator, Messenger, Decision-maker**

Barry and her partner make decisions for the staff regarding the computer lab. At staff meetings, they relay messages from the district office related to technology issues. With Eloise handling building-wide technology inventory and Cindy continuing to work in the lab, Barry does not have to be the solo technology coordinator that some Seed Teachers become.

### **Relationships and Status**

Being a Seed Teacher caused Barry to come out of her classroom and establish different relationships with her peers. Talking about the role made her reflect on her sensitivity regarding colleagues' perceptions of her. "It made me more visible with other teachers. I tend to be more in my classroom than visiting or being with other teachers, and it's got me into other classrooms and I can see what everybody else is doing. I don't know about respect or anything. It's made me respect myself a little bit more, maybe." Barry appreciates the support she receives from her principal, Tom. He provided extra release time to the Seed Teachers to finish a task, and is receptive to other requests for assistance.

When I asked Barry how being a Seed Teacher affected her as a professional, she said " Sometimes I feel more important, and then other times.... just busier." She sees herself as "an instigator, or a consultant. ...more of a guide in where to go for the answers or where to get the materials or who to contact for information. I don't think I'm a leader." She says Cindy, her current partner, Shelley and Eloise are leaders. Is the Seed Teacher role a teacher leader role? "Potentially. I think it can be a leadership role in that it tells people what programs are out and what to look for that would be important to us. Or it could be a trouble- shooting role where you just kind of go and put out fires, or make sure people understand certain things, or set up demonstrations, like a few kids coming in to do the E-mail. Barry splits the job into showing programs and troubleshooting. She apparently sees finding and showing programs as leadership and troubleshooting as helping. She is reluctant to declare herself a leader.

### **What Helps and What Hinders?**

Barry describes working at Cascade Park as challenging, comfortable, enjoyable, frustrating sometimes, convenient, and flexible. Barry's words describe her feelings of ease in the school and her appreciation that her teaching responsibilities fit with her home responsibilities. She lives close to school and she likes having a little flex in times for coming and going. She likes the downtown location so she can use the town with her students, walking to the library or the park, and she comments on the diversity of the school people and her appreciation of it. It is important to Barry that any responsibilities she takes on fit into her family obligations. Being a Seed Teacher helped Barry to focus on learning about computer technologies, something she wanted to do to improve her teaching, and to keep up with her daughter and husband.

Compared to other Seed Teachers in the study, the Cascade Park Seed Teachers; Eloise, Cindy, and Barry, speak with the most agreement about the purpose and functioning of the Seed Teacher program. As Barry says, all see it as a way of "getting people on board" with computer technologies. She describes how she sees the program working over time and cites Eloise as an example, "Eloise is wonderful, because it doesn't matter whether she doesn't have time, she makes time. And you can ask her over and over again. I think that's the goal of having the computer Seed Teachers, because eventually everybody knows a little bit and then they also know where to get the information they need and that's the main thing."

Barry tries to measure her accomplishments by what happens in the computer lab. She is proud to have helped Cindy set it up and order software. She is proud that "we have gotten every single person in it, except like I said, the kindergarten. They have a time slot but they haven't come in as much. But everybody is scheduled at least once a week." Basically, Barry feels that she is responsive to colleagues who need help, she tends the lab, and she is doing a good job as a Seed Teacher.

Important incentives for Barry were the computer for home, her partner, and the pressure to learn. Most of Barry's frustrations come at home when she is trying to work with her DOS computer on her own, and she is dependent on her husband's help. At school, she knows who to ask for help and she does. Barry has thought through many options for helping students and teachers use computer technologies for learning, and she concludes that the Seed Teacher program is the best. She puts a positive spin on all of her answers.

### **Principal Role at Cascade Park**

Pauline Krane was the principal from 1989 to 1993, and Eloise facilitated her first learning on the computer. For the last two years, she was the planning principal of the new elementary school, Hillman, as well as being the principal of Cascade Park. Her time and focus were split between the two roles, and Cascade Park teachers report feeling orphaned. Tom Williams is the new principal. He enjoys the respect of the most teachers and is seen by them as bringing resources to the school and fighting for them at the district office.

He explains the Seed Teacher program as "two certificated teachers who are given a stipend to perform certain duties related to computer implementation in the school, and their duties go from helping to purchase and order computers, to determining software, to helping schedule the lab, to keeping the lab on line, to keeping the computers on line in the classroom, to working with the TEK students to get the E-mail system on line, to networking the school. They have a full time job, with a stipend. Plus their teaching job. So all elements of our computer implementation in the school are touched by the Seed Teachers." He continues, "The main purpose is that they coordinate the overall technology effort in the school, and make sure that what we have is up, running and accessible. And they get feedback from teachers to make sure that what we're trying to do meets classroom or specialists' needs, which is a large job considering the amount of actual time they have to do it. And I think the real difficulty with the technology piece is the time issue. You

almost need someone who can donate certain portion of every day to it, just to keep things on line ..... and moving in a positive way."

Tom figures out how to support the Seed Teachers in their efforts. "Basically the Seed Teachers will ask me for my advice on decisions they are planning to make for the school, in terms of technology. And I give them my advice and we kind of work out what is practical and possible. And I also have some control over budget and expenditure of funds, so any time they need resources or want to purchase software, then they come through me."

Tom sees the program benefiting the Seed Teachers personally. "I think it increases their level of computer knowledge and expertise far beyond where they ever imagined, because they have to grapple with all the issues that everyone is dealing with. I think it gives them a broader perspective of how technology works in the school as a whole, as opposed to just their individual situations, if they are a classroom teacher. I think it probably enhances their ability to work effectively with adults, because that's not an experience sometimes we have as teachers. It probably attunes their team work skills and their negotiating skills and their compromising skills. I think they get a better feel for how the school works as a whole and how budgeting and ordering works. It gives them additional credibility with the other staff members, because it is somewhat a leadership role at times. And they become a resource in the building over time, once they have gone through their two years."

He sums up with his hopes for Seed Teachers, "I hope they learn to be comfortable with the technology. I hope they learn to be risk-takers and try things in their classrooms with technology. I hope that they learn how the system works and doesn't work. I hope that they learn some skills ... or refine their skills in dealing with adults in collaborative kinds of processes. I hope they have fun. I hope it broadens their perspective. Those kinds of things."

Tom appreciates the cumulative advantage of the increasing numbers of Seed Teachers in his school. "I think I probably have six to eight people who've been Seed Teachers at one time or another, and the advantage to that is that they have immersed themselves in the technology to some extent. As a result, it is increasing the number of people within the District who have fairly sophisticated abilities with technology. And have improved their comfort level so that they're more or less advocates for using computers in instruction and in the school. When I first started with it, even when I was back in another district, the biggest drawback was nobody would use the computers, because everybody was afraid of them."

"Now what I see happening is that the people who were most gun shy are taking their kids into the lab and trying to do things, because they know there's enough people around who'll bail them out if things get desperate. Because we have these folks around, first of all they are able to explain the technology to one another better, but also it's improved the comfort level for those who were initially never going to touch a computer. And so I see people in the lab that I never suspected I'd ever see in there, with their whole class."

"It changes the school culture. You get more people who are knowledgeable and who can talk about it effectively and as a result it becomes part of the school. And, it becomes part of the conversation, it becomes a part of your decision making, it becomes part of your planning. The Seed Teacher program has helped do that. Because it's increased the number of people who know what they are talking about. And who have kind of lost their fear of it all. Not that they know all the answers ... they're not afraid to grapple with the issues. And so it's kind of a filtering down process or maybe filtering up, I don't know which. That's probably why it's good to have a finite limit on the number of years that people do it. Two years. Because then another group of different people come in and give it a shot, and it kind of expands the pool of people who know about technology." Tom thinks of the Seed Teacher program as a developmental one for teacher learning and skill building in using computers, problem-solving, and in understanding the whole school. Although Tom is fairly new to the district, the founders of the Seed Teacher program would like his explanation and support of it.

### **Colleagues Reflections and Survey Results**

Cascade Park has eight current and former Seed Teachers in the building. The program was in its tenth year during this study. If a building had retained all of its Seed Teachers, and they had rotated every two years, it would have ten current and former Seeds in year 10. Cascade Park has a higher number of former seed teaches than any other building in the district. It comes closest to the wishes of the founders in the accumulation of experience and helpers in the school.

Cascade Park teachers interviewed for this study were positive about the Seed Teacher program, especially as a learning program for Seed Teachers. One veteran teacher, who helped start the program in another school, said that the essence of it is "Each one, teach one. A few, train more, who train kids. The idea is peers helping peers." She is an enthusiastic supporter of the idea and says "it is probably better than a paid technology

person." She believes that Seed Teachers are "a great benefit to the school. It is essentially a problem- solver role and it has a lasting effect." She says the gist of the program is, "if you obligate people to teach, they will learn for themselves, and share what they learn."

Another teacher is new to Cascade Park, but is a longtime leader in the teachers' professional association at the district and state levels. She sees the Seed Teacher program as a benefit to teachers as they explore using computers with students. She says the current Seed Teachers are not helpful to her personally because they only know about Macintosh computers, and her teacher workstation is a DOS computer. She says she does not use the computer lab, but she knows others do. She thinks that if the district wants the Seed Teacher role to be a leadership position, then it should be a funded half-time position which turns over every two years.

The association leader represents a missed opportunity for Seed Teachers and a demonstration of lack of political awareness. Barry thinks all teachers use the computer lab, and are being helped pretty well, yet this teacher reports skipping computer lab time and finding no help available from Seed Teachers for her DOS computer questions. Through a fluke in room assignment, this teacher is in a room which is not hooked to the computer network because of undetermined difficulties with the wiring. The teacher association leader has a voice that is amplified in many arenas, and she is not hooked to the district network, not using the computer lab, and believes she is not able to get help as a personal user of her computer. She would hardly be expected to be an advocate in contract negotiations for technology issues, since she is not personally assisted in being a competent user of technology. None of the people interviewed understood or commented on the political nature of who is helped and who is not.

Barry's current Seed Teacher partner considers the Seed Teacher program to be about learning. "It is designed to give teachers opportunities to learn about computers if they don't know anything about them, and share what they learned. When your year is done, you still know and are in touch with computers and can still help out. It's not just a one-shot deal where you're just responsible for one or two years. You continue to help throughout, as long as you're in the district. A seed is planted to go on and help other people as you are learning also." She articulates a philosophy which is strongly in place at Cascade Park and not at the other two schools.

The partner reflects on the cumulative feature, "I watched other inexperienced people coming along and really learning a lot, because they were exposed to so much...kind of thrown into situations and they came out alive and happy. People that were willing to make mistakes and try things. That's what gave me the impetus and courage to

put my name in. I was the only applicant. Several people want to do it next year. They are seeing more and more people who are able to help. It's not such a one shot deal, with only one or two knowing how to fix things or troubleshoot or whatever. People saw that it was safe."

All 32 Cascade Park certificated staff members answered a written questionnaire about their skills and their school. In rating their computer-using skills, 33% of the Cascade Park teachers rate themselves as beginners and 67% say they have intermediate skills. None rate themselves as expert.

Beginning Skills	Intermediate Skills	Expert Skills
33%	67%	0%

All of the teachers think that the program is a benefit to the school and 100% say that the district should continue it. Nine teachers want to be Seed Teachers, more than double the number who aspire to the job in other schools. Even with the responsibility of maintaining the computer lab, many Cascade Park teachers understand the role to be one in which they can learn and succeed.

While the colleagues all see the benefits to the school as a whole, they qualify their answers about how helpful the seeds are personally.

Very Helpful	Helpful	Somewhat Helpful	Not Helpful
21%	34%	42%	3%

Without more questions, it is difficult to know if the large score for "somewhat helpful" results from lack of requests for help, or from help asked for and not delivered, or maybe from a skill level higher than that of the current Seed Teacher. In 1992, when the district started with site-based decision-making, and again in 1994, all of the teachers wrote that they wanted to continue the program, knowing that it represented an allocation of resources which could be used in other ways. Perhaps they recognize the program to be helpful to the school in general, and see the benefit to the Seed Teachers as personal learners. As a group, Cascade Park staff believe the most beneficial activities the Seed Teachers do in the school are troubleshoot problems with equipment and software, act as liaisons with TEK students, and run the computer lab.

### Seed Teachers at Cascade Park Elementary

Cascade Park has most fully implemented the Seed Teacher idea as envisioned by its founders. It has developed a supportive atmosphere for teachers to learn and take chances in a new role. The principal supports the Seed Teachers as learners, risk takers and decision-makers. The role has turned over every year, and a variety of teachers have stepped up to be Seed Teachers. All of the Seeds are positive about their own learning and their contributions to the school.

Cascade Park supported the learning of a succession of Seed Teachers. Two of the first Seed Teachers were tentative learners and reluctant sharers. They received Apple IIGS computers for home, used Commodores at school, and were then presented with a choice of Macintosh or DOS computers for their teacher workstations. Eloise remarks that they just wanted the technology to hold still. After their terms of service, they continued to work with their classroom computers, but did not take a high profile in building decisions. One of the first Seed Teachers, now retired, was an expert computer user, who used computers extensively at home and with his students, until he tired of being Mr. Fix-it in the school. Luckily for him and the school, Eloise was happy to be an active problem-solver, consulting with him only when she really got stuck. Eloise shaped the role of Seed Teacher for those who followed. She passed on the meaning of the seed metaphor, and helped Seed Teachers and their peers understand the role to be a learning, risk-taking one. Eloise is the acknowledged technology leader of the school. She works closely with the principal and with each team of Seed Teachers.

Cindy loved being a Seed Teacher, and used it to carve out an identity for herself in her new school. She liked being known as a computer expert, and she was happy to contribute many hours of volunteer service to the school in exchange for the regard and respect of her peers. Cindy focuses on her classroom and on the computer lab. She learned to use Macintosh LC computers, which make up the bulk of teacher workstations and all of the computer lab. In this sphere, she feels competent and she believes she contributes to the school. When Cindy wants to learn something new, she takes a class, asks another person for help, or hires a tutor. Yet when she thinks about how best to teach students or her fellow staff members, she recommends guided group learning in a computer lab.

Barry is a private person, and being a Seed Teacher was a stretch for her. She is a thoughtful learner and teacher, who continually reflected on her own learning and that of other teachers and her students. She became a more assertive problem-solver and

troubleshooter because she was working on behalf of her peers. After being a Seed Teacher, she has a different view of the school as a whole. Her personal learning with computers is a springboard for her reflections on student learning.

At Cascade Park, Eloise, Cindy, and Barry presented do-able models of computer-using for their peers. Eloise helped her colleagues get comfortable with her laughter and by telling stories of her own mistakes and learning. Cindy went from being a non-computer user to a person running the computer lab. Other teachers saw this and thought, "if she can do it, I can do it." Barry, an unassuming, low-key person around her peers, also fell in this category. Barry and Eloise were very willing to tackle unfamiliar problems and talk their way through them, modeling a problem-solving mode. Cascade Park created an atmosphere which was supportive and nurturing to teachers in the Seed Teacher role. In spite of the positive atmosphere for teacher learning, student use of computer technologies occurs in two weekly visits to the computer lab, and hit-or-miss use in classrooms. With a principal supportive of technology growth; an active, helpful library media specialist; and seven other current and former Seed Teachers in the building, we might hope to see more active student learning with computer technologies.

## Chapter 7 Vintage Elementary Case Narratives

### About the School

Vintage Elementary, in downtown Cascadia, is the oldest elementary school in the district. Closed for several years, before it reopened to house the parent-involved magnet program (Learning Incorporated), it is a long, low building, with primary classrooms opening into one corridor and intermediate classrooms opening into the other. In the center are the office, library, multi-purpose area, music room, and various administrative offices. It is a well-worn building which is scheduled for complete renovation in the 1995-96 school year. Vintage hosted 450 students in the 93-94 school year.

Learning Incorporated is the magnet elementary program which has been housed in several buildings over the years. The long-standing debate about the equity of a magnet program was settled in 1992 when the school board voted to continue its existence at Vintage, but to increase the enrollment of the school gradually until it carries its fair share of local enrollment. Parent involvement is still a hallmark of the school. The staff works constantly on various school improvement issues and considers the school to be a special place.

Vintage Elementary won a statewide *Next Century* grant for innovation, by proposing to work on the areas of parent involvement and learning with technology. In 1990, the school bought computers, built a local area network, and has been fully online for several years. Daily functions of attendance, lunch count, messages, bulletin, grade reporting, and all kinds of communications have been conducted online since 1991. The school is an all-Macintosh school in a district which is deliberately multi-platform. There has been confusion among staff, and difficulty in the last year as the school connected to the district network. Teachers have to use a several step process to switch back and forth between the two networks. They prefer the Apple network and software for its functionality and ease of use, but they want to be part of the district communication system. When the school is renovated, it will reopen with just the district network.

When the first computers were purchased, a half-time computer staff support person, Lance Stone, was hired with the grant money and assisted the teachers in learning to use the machines and software. The building hosts several former Seed Teachers who are experts in various computer applications, and who have been district leaders in their

classrooms and among their peers. Two of them founded and led the Seed Teacher group when they taught at Lakeland Elementary.

Principal, Rick Sudbury, supports the Seed Teacher position as a learning opportunity for staff, and he recruited novice computer users to fill the role. With grant money and funds from other sources, Rick has paid several teachers to be in charge of various technology issues. At Vintage, all technology expertise is not expected to come from the Seed Teachers. The two current Seed Teachers are expert Merry Harris and novice Sylvia Hayden. Merry, one of the original Seed Teachers, is taking a second turn at the position. As the music specialist in a small school, she has blocks of unscheduled time to devote to computer technologies. She is a leader in using the Internet and downloading MIDI files to use with her synthesizer. For several years, she has been teaching inservice courses at the local educational service district on computers and music. Merry thrives on figuring out complicated technical problems which take days to solve. She enjoys supervising the TEK students from the high school next door, sharing knowledge with them, and learning from them. She attends the district TEK meetings every two weeks and likes being "in the know" with new developments. Merry's partner, Sylvia Hayden, is considered a novice computer user at Vintage.

The technology bar is higher at Vintage than at the other schools. All of the teachers routinely use computers in ways that are not in place in other schools. Because of the insistence of the skilled users, the long-established Technology Committee has a policy of setting aside 20% of its yearly allocations for high-end equipment. There has been a recognition that the teachers will learn at different rates and that the school needs people out front trying new things. Case studies at Vintage focus on current Seed Teacher and self-described novice, Sylvia Hayden, and former Seed Teacher and expert, Ned Masters.

### **Sylvia Hayden-1st Grade Teacher**

#### **Fragile Learner and Tentative Helper**

#### **Portrait**

Walk into Sylvia Hayden's first grade class at Vintage Elementary and you see activity, color and movement. Students work on the rug in the front, at their tables, up in or under the loft, at the computer stations, or in any number of learning areas. The class is dominated by artifacts of the current theme. Sylvia, about 55 years old, trim and casually dressed, choreographs the activity smoothly, aware of all learners, speaking to each with a

low voice and in a nurturing manner. She states expectations clearly. Parent and student volunteers move in and out of the open door and the hallway is an extension of the classroom. Students are active and comfortable, addressing Sylvia by her first name and moving from activity to activity smoothly.

Sylvia has been at Vintage for six years. She began her career with five years of teaching, and then spent a long period raising her children and working in several volunteer and part-time jobs. She was the part-time coordinator of Learning Incorporated, when it was housed at another building. She loves working at Vintage/Learning Incorporated, and believes the school philosophy mirrors her own. Sylvia is a confident, assured teacher who works as a writer and editor on the side. Her husband died recently and Sylvia is having difficulty coping with the loss. During the year of this study, Sylvia was taking 15 credit hours of classes to move forward on the salary schedule.

Sylvia volunteered to be the Seed Teacher if no one else would take it. She heard that the yearly emphasis was going to be on software and "that was appealing to me. I can handle that. I haven't really delved into it and I'd like to." The letter she got from the district technology person said "we needed to go to a conference and we needed to do this ....and I love to learn. I don't want to just say that I'm going to be in the classroom forever. I want to keep options open to me to do something else. My friend at Microsoft thinks I should be in a think tank at Microsoft. But I can't absorb all of this. I like to take my time. I thought I could push myself to do one more thing this year. I want to learn. I just want to learn."

Sylvia is a first year Seed Teacher, who took the job "because I like to challenge myself, because I wanted to learn more about technology." Her partner, Merry Harris, long-time technology pioneer, thrives on solving computer-problems. Merry's high skill level makes Sylvia uncomfortable. In January, she tried to quit as Seed Teacher, but her principal encouraged her to stay. Sylvia feels guilty because she is not doing what Merry is doing, and she does not know what Merry knows. She went to the first two Seed Teacher meetings and came away feeling that all of the other Seed Teachers know more than she does. Sylvia is uncomfortable sounding so whiny and frustrated, so she explains, "My husband was very into computers and before I always had him at home, but when he passed away a year ago, I don't have that support. I don't go home to anybody to talk to about computers. Because there's nobody at home. So I think that makes a difference when I'm not real technically inclined anyway. I'm never going to understand the hardware part."

In the year that Sylvia was a Seed Teacher, the school came online with the district wide area network, which connects to the statewide network and the Internet. Ned, a fellow teacher at Vintage, designed an electronic report database program which most teachers use. In her daily work, Sylvia writes entries about students into this database, she reads electronic mail on both of the local area networks in the school, she communicates with staff members electronically, and she keeps most of her records of all kinds on the computers. She accesses the school library from her classroom and teaches her first graders to do so. The first graders all write their stories on the Apple IIGS, Apple IIC, and Macintosh computers, as well as use them to work through programs in primary subjects and activities. In describing how she uses computers in her teaching, Sylvia says that she uses Macintosh and Apple primary programs in math, reading, and writing. Parents gave her the program *Publish It* and the students use it. She programs lessons into *Muppet Slate* and the children work through them. The computers in her classroom are in constant use by the first graders and by the adults.

When Sylvia became a Seed Teacher, she was not sure what computer to buy, so she opted to take the stipend instead of buying a computer. To use a computer out of school, she needs to pack home the one from school, which she does infrequently. Sylvia is unsure of exactly what she should do as a Seed Teacher, and she feels she is over her head. She agreed to help troubleshoot the Apple II computers, but hardly anything goes wrong with them, so she does not feel useful. She writes about technology for the parent newsletter, and she sits on the building technology committee which meets weekly.

Sylvia struggles with the role of Seed Teacher. I interviewed her four times and observed in her classroom twice for extended periods and many times informally. We talked in the casual comfort of the reading loft in her classroom, in the elegant living room of her lakeside home, in the staff lunch room, and sitting in the first grade-sized tables and chairs of her classroom. She was reflective and eager to talk about her learning, and her difficulties with being a Seed Teacher. Several interviews were punctuated with tears. When the next school year started, Sylvia asked Karol, a Seed Teacher from another school who had transferred to Vintage, to take over the rest of her term as Seed Teacher. Sylvia continued to serve on the technology committee.

### **Learner**

When I asked Sylvia what she liked about being a Seed Teacher, she looked sad and said softly "Right now, not a lot. I know I'm going to learn. I know I've learned a

lot already. But it's just a bad year for me, so I can't say I really like a lot about it. I have to be very honest." Her eyes filled with tears and she cried. Sylvia's sad tone was very different from all of the other Seed Teachers.

Sylvia thinks aloud more about how she learns than about what she has learned. What are you learning? "Well, as a Seed Teacher, it's been only dealing with computers. Hasn't been doing anything with CD-ROMs or anything. That took place in building time, and whether I was a Seed Teacher or not, I would have needed to get exposed to some of those things. I was exposed to the *Logowriter* and exposed to some software." Sylvia is the only Seed Teacher who carefully separates out what she does because she is a Seed Teacher and what she does as a classroom teacher. Because it is a problematic role for her, she keeps more distance from it and qualifies most answers lest they get too positive.

I ask again, "What have you learned." Sylvia says "I'm comfortable with word processors, and being able to do anything that I have learned. But to problem-solve, I'm not there yet." Sylvia actually solves computer problems all of the time but she does not seem to count much of it. She relates several specific tasks she figured out and does regularly. She is specific in describing what she can do, but seems to discount her work if it does not fit with an overall understanding.

Sylvia says "teachers learn by doing. They learn new things by going to classes." She means they learn by doing in classes they take, and generalizes her own preference to all teachers. "I feel they do best taking a class that expects them to take what they've learned in that class and go back and apply it to what they're doing in the classroom." She says it is hard to learn from her peers in school because "it's so hard to communicate when you're in the classroom all day." She advocates training teachers to use computers in summer classes, separate from the school year. In thinking about her learning, Sylvia declares that she wants to learn in a class setting, separate from the school day, with a class structure that includes an overview, specific skill instruction, and applied practice in her classroom. It is no wonder that the 'learn as you go' philosophy of the Seed Teacher program is not a good fit with her.

Sylvia is a reflective learner. She is amazed that she is so slow, in comparison to her partner, Merry. I ask her why she is so good at so many things and so down on herself and again she cries. "I'm not on top of it...I'm not good at it." This is an important observation for Sylvia. In her classroom, she is on top of the situations and good at teaching. The language of Sylvia, like that of Barry and Cindy, is emotionally charged. Their descriptions of computer-using skills are expressed with self-deprecating comments, and reflections on the feelings of learning. All three women relate their skills and their

learning to that of their current or former husbands, who they describe as expert computer users. These three teachers seem to take their reference points for expertise from their husbands, instead of from their peers at school. In Sylvia's case, she is also comparing herself negatively with her partner, Merry. In fact, Sylvia's grade level partners, Sheryl and Jill, are reluctant and nervous computer users. If Sylvia compared herself to them, she would think herself skilled and moving along fine.

Sylvia has been constantly evaluating herself, alternating between being very hard on herself and trying to find some reasons to give herself a break. "Describe myself ... as a Seed Teacher? Frustrated. Overwhelmed. I've just bitten off more than I can chew. And this is kind of the straw that broke the camel's back." Sylvia is coping with the loss of her husband, taking fifteen credits, and serving on several building committees. While she mentions timing and stress, she does not really factor in a life-catastrophe (her husband's death) and multiple obligations. She continues to berate herself and the program. "I have really high expectations for myself, and so I don't ever like to take on anything that I'm not really good at. And maybe that's why this is frustrating to me. And maybe it's because I'm working with somebody who is so capable, that I just feel like I'm not pulling my weight." These are key insights for Sylvia. She does not like to try anything she is not good at, and she is working in a partnership in which she is not the best and not "doing her share." It is quite an admission for a teacher to say that she doesn't attempt things if she cannot be really successful. The situation is exacerbated because her Seed Teacher partner, Merry, loves the technical part of computers, networking, special lingo, and always talks above the heads of her various audiences. Sylvia knows this in other contexts, but is still trying to measure up to Merry as a Seed Teacher.

Sylvia is a developmentally-oriented veteran first grade teacher. She knows about learning and communication, and yet she cannot look at herself as a learner and give herself time. I ask Sylvia to imagine she is a student in her own classroom feeling overwhelmed, and to describe what Sylvia, the teacher, would do. "When my little kids say they don't want to go back to the computer, first of all I try to find out, 'Is it because you don't want to miss whatever we're doing? What worries you about it? You're not sure how to turn it on or do the program?' I send someone back to listen and help. So I think that's probably what I would do with a kid like me." Unfortunately, Sylvia has not been able to set up a helping, nurturing relationship with anybody as she describes she needs.

Although Sylvia became a Seed Teacher to make herself learn, she does not perceive the activities as learning opportunities. The lack of specific directions concerning the use of two release days was perceived by other Seed Teachers as flexible. For Sylvia,

the lack of a specific menu of options, meant that she filled in the void with assumed requirements for labor instead of learning. The formal learning opportunities provided by the program were frustrating for Sylvia, and she did not perceive day-to-day problem-solving as a learning activity.

### **Teacher**

While Sylvia finds the course and pace of her own learning so difficult, she creates a wholly different and comfortable atmosphere in her classroom for children. She says, "Kids can do a lot. I'm convinced and give the message to others. Just get the stuff in your room. Kids can be helpful. Just get in and get the stuff working." In her classroom role, Sylvia provides many opportunities for students to be active learners with computers.

Sylvia talks at length about all the ways she uses computers in her teaching. Besides using many instructional programs for primary students, she is proud to have "programmed in a little lesson on *Muppet Slate* where the kids would fill in the words. So we did the little story and then every now and then we had a word missing and then they'd have to come and fill the missing word. We are going to program one in on the rain forest. I'll say, you don't have a choice this week. You need to go back and you can work with a partner if you want to." Sylvia uses comfortable language describing what students do with computers.

Sylvia relates her students' learning to her own. "The kids have the same frustration level, that I do. I give them some lessons on what programs are available so we do that slowly, and they have a little repertoire now of about six kinds of software they can use. But I don't force them into going alone. If they need a helper, I tell that helper, 'let them turn it on, let them put the disk in, be there to help but don't do everything for them.' So I try to make it like, 'I want you to use the time, but you're welcome to take somebody with you and go have fun with it.' I want them to be respectful of the computers but to not be afraid of them, to make it kind of fun ...and a learning tool. And now that they are starting to do word processing, they can go back and do their stories. They can do their own keyboarding Basically, to just know that it's a tool that's there and make it non-threatening to them." Sylvia, in practice, encourages the students to use the computers a lot. She is helped by parent and high school volunteers, and the computers are constantly in use. The first graders work through learning games, write their stories and print them. They do not exhibit nervousness or anxiety about the computers. The computers seem to be as much a part of the room as are the art materials, puppets, plants, and books. It seems

Sylvia is talking more about herself than about her students, as the first graders do not act nervous around the computers.

Sylvia and other teachers report high stress at grade report time, because of uncertainty about getting the electronic reports complete and printed. She and parents continually enter information into the database about each student. Printing out the reports is a complicated procedure of adjusting fields so that all of the material will print, and Ned is hired by the principal to help other teachers make it work. "I've been taking the Mac home on the weekends, but mostly I just prefer to stay here. It gets a little cold about six at night. I hope I can remember what Ned taught me this morning. It was so clear when he taught it to me. All our adrenaline goes up at this time. By Monday, I want a printout of these, just to make sure that if I have any glitches, that by Friday I'll have them taken care of."

Asked to describe work at Vintage in 10 words, Sylvia chose "high pressure, challenging, interesting, supportive, dealing with the whole person, caring, cutting edge, innovative, freedom, and so high pressure". She emphasizes characteristics one would expect to find in a recognized exemplary school and a long-standing magnet program. Sylvia begins and ends with high pressure. She characterizes the environment in bold words of educational reform but adds how she feels about it. The feelings of being pressured are related to the amount of parents working with the program and the atmosphere of high expectations and total visibility.

### **Helper**

When Sylvia describes her job as a Seed Teacher, she lists a mix of what she has seen others do and what she expects of herself. "More software exposure, coordinating mini-classes, troubleshooting and calling TEK students if needed, sitting on Tech. Committee. Then attending conferences." Sylvia is unclear about the duties of the job. "Before I used to think of Seed Teachers as being the experts. But now that I'm one, it's kind of learning and then just helping each other."

### **Troubleshooter**

Sylvia explains her job, "It's pretty loose.....you're supposed to trouble shoot things that go wrong with the hardware and try to fix those before you get somebody from the District to do it." She lists the rest of the duties as the expectations about conferences, release days, and meetings. Sylvia's partner, Merry, is an accomplished problem-solver,

and most teachers ask her first for help. Many other teachers in the school are also able to fix problems. Sylvia is frustrated by the troubleshooting expectation. She uses computers confidently for her professional and teaching work, but what she does in her classroom is not visible to her peers. What is visible to her colleagues are her responses to their requests, and she often does not know how to help them.

Sylvia is very bothered by the unpredictability of requests for her assistance. "Many people want things done immediately. If you are in the classroom, you never know from minute to minute, who's going to call upon you for a question. You don't have time and you never know whether your planning time is going to be interrupted." Sylvia articulates this concern as do the other Seed Teachers, although it is interesting that she does not really experience the interruptions the way the others do. As she says about being interrupted at any moment, "I'm not speaking for myself, because many times they don't come to me. They go to Merry. But Merry and I have talked about this, that they want it done and they want it now. They just get very nervous when anything goes wrong with their computers, and they want it done right that minute. You don't have time and then you never know whether your planning time is going to be interrupted. And they sort of have to come first, because you are getting paid, so you feel an obligation." So issues for Sylvia are finding time to do what people ask, figuring out what is expected, and not knowing whether to count on having her planning time. Sylvia repeatedly says that people ask Merry or the former Seed Teachers for help on technical questions, so this feeling of uncertainty on her part cannot be that related to actual number of interruptions, but more to her feeling of not being able to count on having her time to herself and the guilt she feels at not doing what Merry is doing.

Sylvia spent one of her two release days, working with Merry to take a program off of all computers and replace it with another. Merry worked with Sylvia on the first several computers, while Sylvia took notes. Then they split the classrooms, with each working in half. I worked with Sylvia, sitting next to her as she figured out what to do, and helping when I could. What seemed like a straight-forward job actually turned out to be complex, since the computers were of different types, with various systems, memory configurations, and kinds of software installed. Each computer system had its own unique profile, which complicated the job. Many of the problems were new to Sylvia, and she continually sought Merry's assistance. Both Seed Teachers worked until 8 p.m. on a Friday night to finish the task. Instead of feeling some satisfaction about her new learning and the completion of the work, Sylvia used the experience to reinforce her feeling that she is not a technical person and will never catch on to this kind of problem-solving.

### **Inservice Provider**

In describing her role, Sylvia sees herself as "more of a guide, to generate interest, and expose teachers to what's out there, without frustrating them too much, because they don't have time to do it on their own. And then to have empathy. To develop an atmosphere in the school where it's not a 'we' and a 'them', but it's all kind of 'us' together. It's OK to learn slowly. So I guess a non-threatening role. Just kind of sneak it in on people and make it kind of fun or something, but yet get people interested. Sylvia thinks she should be coordinating mini-classes, but has not done so. The principal has paid other teachers to offer courses, which were well received by Sylvia and the staff. Because she is not offering classes, Sylvia describes her role as a guide, which she envisions as one-to-one help.

Sylvia was critical of previous Seed Teachers for going to conferences and not sharing what they learned with the rest of the staff. She resolved "I want to report back to the staff. I don't think anybody ever reported back. So I'm going to report to staff."

### **Technology Coordinator, Messenger, Decision-Maker**

Sylvia learned a lot from serving on the technology committee. Before she was on it, she shared the feelings of her non-technical peers, "They didn't care as long as somebody took care of it and figured out the best thing. They totally trusted the Tech. Committee for making that selection, dealing with that money, just as long as they didn't have to." Sylvia is willing to dive into issues with the committee, but feels lost when the conversation gets technical. She is comfortable discussing learning requirements, but out of her league when the discussion turns to anything technical.

### **Other Helper Duties**

Most Seed Teachers functioned as troubleshooters, inservice providers, messengers, and point people for technology in their buildings. Sylvia had problems with each of these roles, which were better filled by other people in her building, so she worked on other areas. She took on the job of reviewing software, but did not get very far with it. She wanted to coordinate a review of the electronic report card, but did not do it. She did write for the school newsletter each month about technology issues. "A role as a Seed Teacher would be to inform parents, which is what I'm doing this year, about what's going on in technology in the school." Because the principal knew that she considered herself a writer, he asked her to write the monthly columns. Her writing ended up being her main visible accomplishment.

Interestingly, when Sylvia describes scenes in a documentary she would make about Seed Teachers, she includes most of the elements designers of the strategy would include; immersion in problem-solving, helping peers, working with technology issues in the building, teaching with computers, gaining technical skills, and growth in personal learning. "Show early morning, lunch and evening. Always your time can be interrupted. You never know what will happen and who will need you. Off guard..people need you. One standard thing in all of the years is that Seed Teachers take a day off and go in rooms and work on computers. They put something on or take something off. I always thought it was mysterious." Sylvia's image shows her distance from the job, even when it is hers. Now she describes four specific scenes, "I have one where the Seed Teacher has cords around the neck. Now I know how to count the pins for SCSI cables and I know where the extra ones are. I'd have a picture of PR, writing articles. I would show teaching, showing teachers or kids how to do a skill. There should be a scene of problem-solving."

### **Relationships and Status**

In relation to her principal, Sylvia believes that Rick knows she is overwhelmed and might be guarded in what he asks her to do. She says their relationship is unaffected by her being a Seed Teacher, adding "he's better at trouble-shooting than I am." For many Seed Teachers, the contact with district technology staff and colleagues in the building is new and rewarding. Sylvia reported "not much contact" with the district technology staff. "Merry is comfortable with them and does most of the talking." Sylvia does not experience the outside-of-the-school contact that is affirming for the rest of the Seed Teachers.

At Vintage, all of the former Seed Teachers play an active role in the school. Ned, Serena and Carin are hired by Rick, the principal, to do specific jobs related to computers, both with troubleshooting and with staff training. Karol and Tara teach classes on various software programs after school. Merry, the current Seed Teacher, was also hired on various supplementary contracts, to write manuals or do specific needed jobs with technology. The high level performance of all these people sets a high standard for Sylvia, and she feels she cannot not measure up.

### **What Helps and What Hinders?**

Sylvia took the job of Seed Teacher because she felt like it would push her to learn more. She is struggling with it. Her principal purposely recruited a novice, knowing that

Merry was so capable, as were others in the building. His hope was that immersion in technology problem-solving would be a learning experience. Sylvia took the role, declaring herself a novice and understanding that he was gentle with his expectations. He told her often that she was doing a good job, and encouraged her to write monthly newsletter articles because writing is a strength area for her. He is positive about her contributions on the Technology Committee. She appreciates the support of the principal and stayed on through the year, even when she wanted to quit in January.

Sylvia is a capable, veteran teacher in a well-equipped building. She holds her own with all of her high-test peers when it comes to creating an active, nurturing classroom or debating a current issue, but she is struggling mightily with the Seed Teacher role. She is used to taking on challenges and being the best at what she does. She admits that she does not take on situations where she cannot be successful. Learning, teaching and helping with technology are difficult, complex tasks and Sylvia is overwhelmed. The learning opportunity Seed Teachers enter is learning by doing, learning by immersion and risk-taking, learning from staff and students, and finding resources as they need them. While Sylvia says that she sees Seed Teachers as people who learn and then help others, she does not internalize this explanation. When Sylvia describes how she wants to learn, it is almost the opposite model. She wants to work on her learning separate from her teaching, and in traditionally-structured learning settings.

Sylvia's fuzziness on the expectations contributes to her frustration with the role and her feeling that she is not doing what she is supposed to. When she looks at a list of all possible tasks completed by Seed Teachers across the district, she is sure that it is a prescription for each Seed Teacher, and she finds herself lacking. Without clearly stated expectations, Sylvia compares herself to Merry. Merry is a voracious computer hobbyist and uses computers in ways Sylvia does not even aspire to, so Sylvia is setting herself up for disappointment with this comparison.

Sylvia says several times that she is taking 15 credits at a local university, and she is still very much in grief for the passing of her husband, but she does not factor these things into her evaluation of her slow progress with computers. Sylvia is one of the only Seed Teachers to take the stipend instead of buying a computer. It is difficult to lug a computer back and forth, so she misses out of the hours of home use which other Seed Teachers use for learning and skill improvement.

As a designer of the Seed Teacher strategy, fellow Vintage teacher, Ned, has observed Seed Teachers over the years and he comments on Sylvia. He is worried that "unrealistic expectations are placed on people's levels of expertise. For someone who's

coming in to being a Seed Teacher for the first time, there's a lot of guilt that they go through, not feeling like they can do a good job. The other part that happens is when you have somebody who's been very proficient for years, like Merry, and someone like Sylvia jumping in. All of a sudden you have one person who's very new to it, diving in with somebody who's been an old seasoned "pro". And the only reason this situation works is because Merry and Sylvia are close enough to not have that happen. But I've seen it work the opposite way. Where the "pro" would leave that person in the dust to feel low." At Vintage, Sylvia did feel low, although she took pains to say that Merry did not make her feel that way on purpose. Eloise, Cindy, Barry, Jack and Grace all advocate the "master-apprentice" model of Seed Teachers, but Sylvia said several times that it made her feel bad, and if she had been with a person of equal level, she would have done more. Because of the various ways in which people become Seed Teachers, both models exist all over the district.

Sylvia mentions often how much she enjoyed learning from Lance Stone, the technology staff development specialist, when he was in the building. She liked depending on him for information and ideas, and she especially liked his accessibility. She hates to bother someone who is teaching, so she loved the chance to call on someone whose job it was to help staff learn to use technology. When I ask her several questions related to the best way to spend limited funds to inservice teachers, she wrestles with the idea of specialists. She casts about for a solution to paying a full-time teacher a stipend on top of their job. "Maybe we could use those TEK kids more. I don't even want to look at hiring a specialist." Even though she liked learning with the grant-funded specialist, she does not advocate hiring a specialist with building funds. As a veteran of the school system, she understands that something would have to be given up to get a specialist, and she apparently does not think the trade off worth it.

In talking about what she herself would do if she were to design a program, Sylvia gives her most positive comments about the Seed Teacher program. "We've got so many people now, in our school, that are using software and are sort of experts. I love the idea of the Seed Teacher program. The ones that I'm thinking of have been Seed Teachers. And so they've either gotten an interest through it or they've learned through it or something. It does work, so there's not just one expert or two experts in the building. We have really quite a few real knowledgeable people now. So I don't know what the answer is. I don't know what I would come up with." Although she liked learning with the specialist, she recognizes that the distributed expertise in her building probably comes from the Seed Teacher program. This is a difficult conclusion for her because she knows how

how much she personally is struggling, "But I do think that being a classroom teacher and a first grade teacher, and the kind of teacher I am and the kind of energy I put into my every day, that doing this on top of it is really a lot. Even if I don't do anything, the stress is so great." The Seed Teacher role was not a fit for Sylvia, perhaps because of timing in her personal life, her other commitments, learning preferences, temperament, and/or unclear expectations and inadequate support. Sylvia took on a big obligation at a time in her life in which she was grieving the loss of her husband. Much of the tearful desperation she expressed is probably due to timing. However, other parts of the disequilibrium she felt could have been used to provoke her thinking about teaching and learning. If she had been supported more in her learning, and encouraged to reflect on her experiences in conversations with other Seed Teachers, she might have made big growth strides.

### **Ned Masters-5th Grade Teacher**

#### **Founding Seed Teacher and Software Designer**

#### **Portrait**

Ned Masters is described by his peers at Vintage Elementary as a "visionary." He and a group of district employees came up with the idea of Seed Teachers, and he is remembered by some of them as the person responsible for coining the term "Seed Teacher." He was a founding Seed Teacher and has continued to think about staff development strategies to move the district forward. Ned is a fifth grade teacher in his mid-forties. In his 20 years of teaching, he has created and run a private school, pioneered inclusion models, and worked continuously to support his classroom work with evolving designs of computer tools. Ned is a casual, unassuming man who speaks to students and adults alike in the same matter-of-fact, informal, enthusiastic way. His classroom is recreated often by the students as they work through different projects.

Computers are among many learning tools present in the classroom. Ned describes the use of computers in his room, "The kids are designing their biological filter for our pond. We'll be bringing back our probeware from the high school so they can do pH tests and other tests on the computer. They've done them physically with limnology kits, so they know how to run hand-done experiments, which is part of the process, then we'll shift over to the technologically-run experiments. Checking their accuracy, speed and efficiency in use...those are applications that come up." He tells about a project in which the fifth graders studied and created tessellations, with art materials and draw programs on the computers. Ned displays the class newsletter, "The first class paper this year took

three months to prepare. The kids had to learn to use the digital camera, learn to use *Pagemaker* and *PhotoShop*, and learn to use the scanner. They wrote and edited. When they finally published, the kids told me the writing stunk. 'Ah, good point.' They are developing sound skills of self-criticism. All kids meet individually with me at least twice a month to go through a critical evaluation. This second paper took them two weeks."

Students work on whole group, small group, and individual projects. Several parents assist or lead projects and field trips. Students sit at four large tables, or cluster at various work spaces around the room. Assorted computers are available. The atmosphere is one of purposeful activity. Observed activities included students watching a video shot by a group who visited a wind tunnel at the local University; students moving from station to station to create a variety of world masks; demonstrations for group evaluation of geography games; and problem-solving with math puzzles in small groups. Many parents request that their children be placed in Ned's classroom, and he has taught several sets of siblings over the years. His teaching style and philosophy differ from his two fifth grade teacher colleagues, who teach in a more traditional teacher-centered manner.

Ned describes his computer using skills, "I would say my skills are at a point where if I have the tool I can learn how to use it in a minimal amount of time. Give me the toys and the time to play, and I can do it. I do the design work constantly mentally. When you teach process, you examine the processes that kids are using and I see what we are doing in class, so I create the applications each year." A sophisticated electronic portfolio/progress reporting system designed by Ned is used at Vintage and by some teachers at Endeavor Elementary. He is contracted by Plains High School to help design an evaluation system for the 1994-95 school year and is on a statewide committee working on assessment issues. He has been talking to district administrators about designing district wide systems which would work on the local and wide-area networks. He is working to create systems which "help us with our teaching as well as provide documentation for parents."

Ned's undergraduate degree is in Fine Arts and he is a practicing artist. His home, quite a drive from Cascadia, is uncluttered, modern, and artfully decorated, a contrast to the classroom which evolves with each new student project. He devotes time nightly to building and reading stories with his young son, and working in his home office on software design projects. He is on the core team for a new middle school and is looking forward to the challenge of a new school, different ages of students, and a new school design. During the year of the study, Ned spent many hours in meetings out of the school building, but he rarely worked late afternoons or evenings. Ned is hired by the principal to

support his colleagues in the use of his electronic portfolio program, and the time for this is before school or whenever he can catch up with the teachers. Time to get everything done is a troublesome issue for Ned, but he is adamantly protective of his evenings at home.

### **Learner**

Ned describes precisely what he can do and has done, and is matter of fact about being able to learn new programs and new tools easily. He describes using computers since the first days of computers. He says "twelve years ago, I had been writing spreadsheets to do all of the programming. I worked at the University and converted some of the stuff (the professor) had done from Pascal to Basic, and wrote Basic programs that would do a lot of precision teaching type things. I was converting stuff from some of the old high-powered main frames to run in Basic on a Commodore, and then running systems that would do that. What it teaches you is the logic for what's going on. So you understand the logic of the system."

He is on the core team for the new district middle school and in the midst of personal design work for electronic assessment. "I'm always looking to keep myself moving. And keep myself alive." He is happy to be moving to the middle school. "There's a lot of types of things that you can do as you get to the older kids that I look forward to playing with, and I've had a ball every age I've taught." He has been looking at "where you go career-wise, and particularly with a lot of the technology and things that are going on. The minute you leave the participatory role as a teacher and a practitioner, you lose a lot of the essence that's there. People ask me, 'why didn't you apply for this job or why didn't you apply for that job?' And the truth of the matter is that when all you are doing is programming and writing, you tend to get very clinical, and the blinders come on. You tend to lose the ability to accept and seek out valid criticism, because you're not running into it day to day. You design a system and you expect it to work and when it doesn't you say, 'well, these idiotic people, they don't know how to run it.' You hear this from the TEK committee, too. Its the same kind of thing. I think that mentality happens when you are not a day-to-day practitioner."

Ned is accustomed to being ahead of other people. He is working with a small group of teachers at Endeavor Elementary who are using his electronic assessment tool, and he thinks they are ahead of their peers. "It's real uncomfortable for them to be out in ground-breaking territory, where there is no pre-invented wheel. If the Wright Brothers pulled up in 1909 with their gizmo, they would never get on it. I would have been up the

night before they got it out. And I would have sneaked a ride." He thinks about how to help people. "One of the ways that people change, is you don't force them. You just kind of have to enjoy it and watch them grow. Ned quit his commitment to the district computer committee because he felt it held him back. "Personally, I was getting so frustrated. There is no driver's license, you have to just go ahead. Take a risk and teach something. It's not that what I do is the best answer, but I can't sit back and wait. I'm too impatient for that. Plus it's fun."

Ned's beliefs about his own learning and teacher learning in general are woven through his conversation. He believes in process teaching, individual learning, and risk taking, and thinks teachers are too timid. "People need to be thrown into an environment where you have to rely on your problem-solving common sense skills. When you rely on those skills to create a product you need, rather than depending on somebody else to supply all the answers, you become a different person." He believes student and teacher learners alike should be immersed in problem-solving situations. "There are also innumerable processes that need to be taught to kids rather than told to kids."

Ned's ideas are characteristically different from the other Seed Teachers. He associates the use of computer technologies with a trend toward process teaching, and the design of personalized curricula. He believes the Seed Teacher program is a "training model which engrosses people. It is one-on-one and therefore the most efficient." He thinks this model is the way to promote "more changing in teaching." He likes the TEK idea (of creating computer networks using student workers) and the Seed idea, and thinks they are "small ideas which spread. This happens with good ideas. They start quietly and spread informally. They initially focus on personal learning." He is worried that district administrators have no vision and feels that it is a critical time to "redefine the essence." He thinks the essential ingredient is risk. When he looks at Vintage, he knows he personally thrives on risk. He sees that learning technology is "not so scary for Merry and is very scary for Sylvia." He wishes the focus of the program would be redefined publicly to endorse the learning and risk-taking of Seed Teachers.

## **Teacher**

Ned describes working at Vintage by saying there is a lot of change, very divergent teaching styles, tremendous parental support, freedom to deal with important academic issues, encouragement to teach what you believe, and a current staff focus on deep trust building. Ned's words are all related to his perceptions of the whole school and the

environment in which he teaches. He expresses his values by emphasizing the differences between teaching styles, and the freedom to teach as he chooses. He continues that the staff is dealing as a whole group with heavy issues of trust building and have hired a consultant to work with them on trust and communication.

Ned's description of using computers in teaching is interspersed with describing process teaching and his observations on learning. "I deliver a performance skill level lesson that the kids have to work through. And then at the high end, there's another piece for those other kids. And so kids can spread out in any lesson at their performance level. And I just feed through and facilitate whatever they're really capable of handling. So there's very few graded papers in here. But there's a lot of things where the kids can't throw away any work that they've done. They need to save it, review it, show the corrections and we work on correction through growth rather than overall grading."

Ned talks about the future he is targeting. "That's the next wave of education, that our kids will be working to learn, not learning to work. Give them a process. Work to produce your goal." He is excited about working with the middle school staff. Ned is also immersed in designing electronic record-keeping systems. "We need to communicate the change in teaching and learning. There is no communication tool for that. We have to start building those tools. If I was going to rewrite a database right now, I would develop a neural system. We need databases that have a whole system, and then each individual teacher's unit has their own database that works independently and sends to that unit. We don't have databases like that now. They're all singular monarchs that control all applications. We don't need that anymore." Ned thinks about teaching with technologies in relation to the fifth graders and their parents, to the upcoming middle school students, to the middle school teachers, and with various groups of adults with whom he works and thinks.

Ned reflects on his role in the classroom and how that helps him as a designer and as a helper. "When you're a practitioner that goes in day-to-day working with the same problems, you become very aware of the needs. And particularly in a school environment, as things are changing. Understanding what it takes to change and what the demands are, is one of the key roles to be able to make change. And one of the things I think is changing technologies and changing worlds is people who are consumers of their own products are sometimes the best designers."

## **Helper**

Ned was an original Seed Teacher, was on the district committee for several years, chaired it for part of the time, and returned to the ranks of Seed Teachers for one year when Learning Incorporated moved to Vintage "because nobody else wanted to do it and they wanted me to make decisions." Ned continues to troubleshoot on technology issues with a paid stipend from his building, but he has not been directly involved with the Seed Teacher program in several years. Ned says that the Seed Teacher program was designed to get training into the buildings. There were limited resources and the design was "90% necessity". He is a continuing advocate of committing teachers to help their peers.

## **Troubleshooter**

Troubleshooting hardware and software problems is what Ned does all day, in the classroom and out. He likes tinkering, fixing, and designing with computers. Since he convinced his principal at Lakeland to buy a computer for the school in the early 1980's, he has been a technical resource in each of his schools. As needs grew, he has insulated himself from constant demands by trying to structure and limit his involvement.

He believes that immersion in problem solving is good for teachers and leads to their learning. He thinks the major benefit to Seed Teachers is "Stress. They may not see that as a benefit. Long term it really is, because it's almost like taking the reluctant kid who wouldn't learn how to swim and you have to grab him up and hold him in your arms and jump into the water with him to get him wet. That is the most powerful benefit, which is why I also believe that we should always be putting new people on and rotating ... get a whole staff on within in a certain cycle. Not have your old cohorts sitting on that position getting computer after computer, year after year and not really giving everyone a chance, because that model doesn't work. You can't have the same person as your Seed Teacher year after year after year. That really defeats the process." Ned was a reluctant Seed Teacher for his last year-long stint. He likes his current situation better, "For the last three years, I've had supplemental contracts with Vintage. Basically any time I walk out of the room, I'm dealing with those issues. That to me is my solution. The Seed Teacher is the learning role, and a supplementary contract is more the service role."

Ned sees immersion in the learning situations provided by the Seed Teacher position as the reason why so many exciting technology projects are currently happening in the district. "People have overcome their fears. They've started using things. People that have had technology in their hands are the ones that have made some of the new programs

viable. I think you can very directly relate those to the Seed Teacher program, via the earnest interest in those people when we designed that program in the first place. It wasn't that the Seed Teacher model was to be the cure-all. It was an avenue to open the doors. And I think it's still serving as an avenue to open doors in any way it can."

I ask Ned to imagine the documentary he would make about Seed Teachers and he describes his ideas, not his scenes. The theme of the documentary would be "teachers taking risks." The entire film would be about "taking risks and finding solutions." He would film Sylvia publishing papers and having a dialogue with her about how hard it is to be a Seed Teacher "without being perfect." He feels she does not "see the enormity of what she has accomplished." He would show Merry as very "adept, with enormous amounts of energy." Ned would go back through time and film the changes that technology has made in how people organize and solve problems. He uses Serena Barton, the library media specialist and former Seed Teacher, as an example. He sees that her thinking changed when she created a library and building network, and that when a person sets up file structures, it is necessary to figure out what is important." Ned stresses that the intent of the Seed Teacher program is risk taking, and current leaders need to figure out how to support Seed Teachers as learners.

### **Inservice Provider**

When Ned and his colleagues started the Seed Teacher program, one of the expectations was that Seeds would lead classes for other teachers in maintenance of computers and use of various kinds of software. Ned offered various classes for several years, both for his school colleagues, and for groups of Seed Teachers. He and another teacher co-chaired the Seed Teacher meetings for a couple of years. At Vintage, he pulled back from this role.

### **Technology Coordinator, Messenger, Decision-maker**

Ned has always been out in front of his colleagues in relation to computers. Most groups of teachers were happy to have him make decisions for them. In his last stint as Seed Teacher, he took the role on for a year, just to get the school up and running in the new building. He was involved in the writing of the *Next Century* grant and in the decision-making and implementation of building technology goals, including the hiring of a technology trainer. While he disengaged from much direct inservice and troubleshooting, he maintained a big role on the building technology committee.

## **Relationships and Status**

Ned is a frustrating character to many of his peers. They do not know what he is talking about, and they cannot imagine doing the kinds of projects he does with students. Teachers who depend on his help want more time from him, because he often runs in, fixes something and leaves. He is well-regarded by other teachers, but they do not aspire to do what he does, as it seems out-of-reach. Ned's students model what students can accomplish with technology, but as in most schools, there is no continuing arena in which to share teaching methods or student processes. Ned's advice on the technology committee and his continual reworking of his assessment tool push the other teachers into an online workplace environment. Other teachers look to him for advice and inspiration, but they do not aspire to do what he does. Whereas Cascade Park teacher Cindy functions as a bridge between novices and accomplished computer-users, Ned's role is more complex.

Rick, the principal, and Ned have a hands-off kind of relationship with each other. Rick pays Ned to work with all of the teachers on the electronic reporting program, and to continually tailor it to the needs of Vintage.

## **What Helps and What Hinders?**

Ned was helped by the opportunity to meet with other teachers throughout the district, and share research and ideas as they ushered computers and computer training into the district. He wrote yearly vision papers for Superintendent Sara Brand outlining current and future issues and directions for the district. Ned takes a broad view of teachers in his building and across the district. He is a comfortable user and teacher with technology and enjoys puzzling through how to create system wide programs and tools.

He has been helped by the resources acquired by the district and through his own initiative. He convinced his staff to set aside 20% of building technology money for high-end users. He has been allowed to run a fifth grade classroom of his own design. He has been supported by stipends to help fellow teachers with the electronic database, desktop publishing and multimedia production. He continually revises his database in response to specific teacher needs and problems. When Ned felt held back by others, he ducked. Ned maintains a small group of teaching friends around the district. He goes through high and low involvement cycles with district technology programs and issues.

### Principal Role at Vintage

Vintage Principal, Rick Sudbury, is a fan of the Seed Teacher program and is "pleased the district has stuck with it. I don't think it should be given up. If the program stops, this building would have to decide if we wanted to spend part of our money to keep a couple people going in that kind of mode, and provide them release time and staff development money which would allow them to keep learning, and coming back and sharing. When Vintage got its first local area network, Rick immediately put all school functions online. "The learning curve was enormous. We did have a technology trainer half-time. What made the difference, the Next Century grant or the Seed Teachers? It's hard to know."

Rick says the Seed Teacher program has "spread the wealth, so you don't end up with knowledge isolated with one or two people." He likes it being a two-year commitment so that Seeds "have a longer chance to grow." Rick recalls a staff meeting in which Seed Teacher, Merry described how to switch from the old building network to the district network. "I had nine teachers who raised their hands and said they were comfortable doing it, and would help others." He sees that the program has "really spread the expertise out."

Rick observes that the program has worked differently from year to year. "Some years it's worked where they've been giving assistance or one-to-one tutoring or one-to-one help when a particular teacher needed a specific thing. Other years, the teachers have taken on bigger things and taught classes. This year, they've broken into two segments. One is a troubleshooter, hardware technology-oriented person, the other one is focusing more on curriculum issues in relation to technology. So it's really been dependent just upon the staff."

Rick believes that the Seed Teacher role builds self confidence. "I think it puts them in a leadership role. I've sort of thrown them into it, because of the way we've tended to do it, where we've tried to push it on novices who are scared to death of it. I think it's been a real self-esteem builder. In some cases it's taken skeptics who didn't want to do anything with technology and they thought it would be a pain in the neck. And it's changed that for some of them. Then others, it's provided them with time or the opportunity to really do some incredible things that they didn't have a chance to do before."

Rick describes characteristics which describe effective Seed Teachers. "Some administrative skills. A good communicator. The most successful are the ones who knew

what they had to do and they didn't quit until they got it done. The willingness to fail, knowing that that's how they learn. Willingness to take a risk." Rick picked Sylvia to be a Seed Teacher knowing that she considers herself a novice. He hopes that being a Seed Teacher will develop her skills and build her self confidence. When she told him she wanted to quit in January, he talked her into staying and said she was doing just fine. He says "like any kind of change process, nothing's guaranteed. There's always a lot of starting and stopping and missing, taking the wrong step or going the wrong direction and backing up and finding out it wasn't right. I guess we have to get comfortable with the fact that it's going to be messy."

Rick uses developmental language in describing Seed Teachers, and says they have very different personalities and learning styles. He has seen the program be successful even though the people do very different things. Because he funds teachers in his school with supplemental contracts to do specific technical things, like hiring Serena as a network administrator and Ned as a troubleshooter for the electronic report card, he is not dependent on the Seed Teachers to provide all technical assistance. He has never observed or heard of the staff being impatient with a Seed Teacher who did not know something, and says that the Seed Teachers have been very conscientious about finding someone to help with a problem if they can't solve it. The level of technology use and technology expertise is high at Vintage. Rick sees the Seed Teacher job as a learning role, and a way to slowly get everybody trained.

### **Colleagues Reflections and Survey Responses**

Vintage Elementary has seven current and former Seed Teachers. The Seed Teacher role is well accepted by colleagues and principal. The teacher association representative, a kindergarten teacher and reluctant computer user, says she is a beneficiary of the Seed Teacher program and feels she has learned little by little from a succession of Seed Teachers. She worries that if there were only one person per building who was the computer expert and nobody else knew much, that she would "be waiting a long time to get the help I need. But now I know there are many people in the building who can help me." Most teachers in the school appreciate the number of people they can call on for advice or assistance.

Merry Harris, long-time music teacher, computer user and teacher educator is Sylvia's partner who says, "being a Seed Teacher provides the motivation to go out and to continue to be a learner and to keep growing. Because of the way we've done it at Vintage

where we've tried to get novices to be the Seed Teachers so they become learners, I usually know more than the Seed Teachers. There are a lot of people at Vintage I can question, because they know a whole lot more than I do. They were Seed Teachers. At one point along the line, most of us have been. It's not that their knowledge necessarily came from any classes, they've learned by being a Seed Teacher. I have the motivation, I'm going to go out there and learn it."

Merry reflects on conditions which allow people to be Seed Teachers, "empathy, patience, limited commitments on the family level, in building at 7 am...until 7 pm. To really do everything that needs to get done, it takes long hours. It takes someone that has that burning passion for learning about this technology. This is a real priority for them and they don't have other commitments that are going to be damaged by that priority." She thinks the greatest need is for "time. Time to play with the technology. Time to play with it in a safe environment. Teachers are very competitive animals, they don't want to fail in front of other teachers."

There are seven people at Vintage who have been Seed Teachers, which is over a third of the staff of nineteen. Teachers at Vintage spend more hours per week using computers than teachers at the other schools. Three-fourths of the teachers consider themselves intermediate users of computers while the other fourth split equally between beginners and experts, so 84% of the teachers consider themselves to have intermediate skills and above.

Beginning Skills	Intermediate Skills	Expert Skills
16%	73%	11%

Classrooms have two or more student computers, with the average being three. Most of the classroom computers are in the Apple II family, although donated DOS computers and Macintosh computers purchased with technology-levy money are increasing. The school has a continuing and often articulated philosophy of putting all computers in classrooms and in the hands of children. All teachers report the Seed Teacher program to be a benefit to the school and wish the district to continue it. Four teachers want to be Seed Teachers in the future. By a large majority, the staff at Vintage find Seed Teachers to be helpful to them personally.

Very Helpful	Helpful	Somewhat Helpful	Not Helpful
59%	35%	6%	0%

Colleagues say that the most helpful activities performed by Seed Teachers are troubleshooting hardware, serving on the Technology Committee, and helping with electronic mail. The majority of teachers also said they benefited from troubleshooting software problems, teaching various programs and general computer skills, providing technology information, and acting as a liaison with the TEK students. Vintage teachers use technology continually for professional activities and for teaching. They had more needs from Seed Teachers and appreciated a greater range of service activities than colleagues at other schools.

### **Seed Teachers at Vintage Elementary**

Vintage Elementary has been the beneficiary of three separate initiatives, which combine to make it an active learning environment, with a lot of computer use. As the home for Learning Incorporated, it has the energy of an active, organized parent involvement component. A constitution describes the role and responsibilities of parents and teachers, and there is a continuing focus on improving the program. When it won the *Next Century* grant in 1990, the school started a three-year program to enhance parent involvement and to improve student learning with technology. Many computers were purchased, and connected in a local area network. A technology consultant helped teachers use and teach with technology.

Over the years, much local expertise has been nurtured by the Seed Teacher program, combined with personal initiative and using the resources of the grant to contract with teachers to learn and share skills. Serena Barton built the library network and was hired with a stipend to be the building network administrator. She invested many hours of paid and unpaid labor to fix technical problems and assist teacher learners. Ned Masters has worked for years, helping teachers with the electronic reporting system and troubleshooting. His students have demonstrated what learners using technology tools can create. Former Seed Teachers are hired by the principal to teach inservice classes. Music students learn and perform with a variety of electronic tools. Because all of the computers are deliberately in classrooms, student and teacher use of computer-related technologies happen throughout the school day. Parent and high school volunteers provide extra help and extra resources.

The daily work of teachers and students at Vintage includes use of computers. With all school functions online, all teachers, even those who consider themselves to be

novices, regularly use the local area network to get information, and communicate, and they keep records on an electronic database. Most students use computers at times to write and to learn. Technology is championed by the principal, the library media specialist, the music specialist, and several classroom teachers. The atmosphere for Seed Teachers is different at Vintage than in other schools. Seed Teachers have to find a service niche to fuel their personal learning.

## **Chapter 8**

### **Lakeland Elementary Case Narratives**

#### **About the School**

Lakeland Elementary, with 625 students in 1993-94, is one of the original schools in Vista School District. It is an older collection of one-story buildings and portables. Every four classrooms share an inner conference room, and all classrooms open to outside corridors and are lit with a wall of windows. The school, which stairsteps up a hillside, has grown as the neighborhood has ballooned in size. Formerly a quiet little rural/suburban school, Lakeland is now smack dab in the middle of booming growth. Endeavor and Denman Elementaries are both within walking distance and another elementary school for the area is under construction. Lakeland is five minutes from both the old and new middle schools. All three elementaries are overcrowded, and the new one will barely relieve the pressure. The school is scheduled for a remodel in 1995-96.

Original Seed Teachers, Ned Masters and Carin Dalton (now at Vintage), worked at Lakeland and purchased some of the first computers in the district. Lakeland was the site of early training sessions for district staff. The school has a senior staff and should have a number of Seed Teachers by now. In fact, it has only five; Jack and Grace, the current Seeds; June, whose term was several years ago; and Rory and Morgan, who just completed two-year terms. By the year 1994-95, there were only four, as Morgan left the district. Where are the other Seed Teachers? Jack was a Seed Teacher before. His partner, Will, has retired. Carin and Ned transferred to Vintage.

Lakeland staff view themselves mostly as beginners. The school averages one teacher computer and one student computer per classroom. This is less than at other schools, because Lakeland has not been the recipient of extra equity money given to Cascade Park and two other schools, a state grant like that awarded to Vintage, or extra computers found in the three newer schools, purchased with building start-up funds. Lakeland's computers include a variety of models purchased over time, and the two per classroom funded by district technology funds. The principal, Susan Sutton, transferred to Lakeland from Woodland Elementary for the 1992-93 school year and technology is not a major focus of hers. The library media specialist, Carmen Kane, is struggling to get the library online, but technology is not her area of strength either. Jack and Grace, the focus of these case studies, have informally helped their peers in learning to use computer technologies. They proposed to be Seed Teachers together and Susan accepted. They hit

the school like gang-busters, organizing hardware and software, devising a system for addressing teacher concerns, offering inservice sessions, and keeping track of their work.

### **Grace Harris-Physical Education Specialist**

#### **Confident Learner and Efficient Helper**

#### **Portrait**

Grace Harris, 47 years old, confident, straight-speaking Physical Education specialist for Lakeland Elementary, is a first year Seed Teacher. She laughs and says, "I run the school." She has been a teacher for 18 years, with a six-year break in the middle to take care of her daughter. She was the Physical Education coordinator for the district, wrote the K-12 Physical Education curriculum and conducted ongoing inservices for teachers. Grace came back to the school level when central office curriculum positions were eliminated. She runs a tight ship in the Lakeland Elementary gym, which she designed. She likes being a Seed Teacher because "it's fun. I like to try to solve problems. People thank me. That's a nice reward. I have time. I help people in the morning and in the afternoon." Grace's husband was sick for several years and died in the winter during this study. Her daughter and baby grandson live with Grace now, and are the focus of her time at home. Grace is a coach for several teams and runs the district fifth grade camp program.

Grace bought a computer with her Seed Teacher stipend, which she keeps at home, and uses mainly to figure out the problems other people say they have. She lives close to school in a spacious log house filled with her late husband's outdoor artifacts and her grandson's toddler toys. She says "I don't really use a computer much. I do once in awhile. I have a computer at home. But I don't have money enough to keep track of my finances." Speaking from her office/equipment room in the gym, she says, "My lesson plans are on *Excel*. I change them all of the time. But kids don't use this computer. There's nothing I need them to write in here and I don't see any reason for them to be in here playing a game." With my probing she says, "Well, I do have my curriculum on the computer. I do Little League. I have my Camp Casey stuff, I'm the administrator and I do the scheduling. I also do the phone tree and scheduling of teachers in this building." She also tracks all of the students for various activities and does her inventory on her work station. She uses her e-mail and voice mail daily, and is working her way around the globe and she discovers new things on the Internet.

## Learner

Grace's "impression is that each Seed Teacher starts learning stuff and then they share their knowledge with the classroom teachers. They are required to go to classes which would force them to learn more and then share it with everybody and help everybody along so that we become a team to learn, ideally. It is good theory. If we don't have staff trained, no one will learn."

As a Seed Teacher, Grace is learning to troubleshoot problems on DOS and Macintosh computers, fix printer problems, help the network run smoothly, and figure out how to work in various software programs like *Microsoft Works*, *Word*, *Excel*, and *Powerpoint*. She and Jack want to learn more about the network and are trying to learn from Manning, the TEK student who comes to Lakeland on Monday afternoons. She and Mack, the custodian, are puzzling through the Internet, figuring out different applications.

How does she feel about learning to use a computer? "Well, when I got the computer three years ago, I really didn't know how to turn it on. I was not afraid. I just saw no reason to turn it on. I like to find out why something's working and why something doesn't, and try to solve it. I wish there were time in the day to do it." As a learner, Grace wants "to get in and experiment, not read the book. I'm not afraid to try it. Basically, I buy the book and don't look at it. I guess I am a hands-on learner." Grace is positive and clear about the affect on her problem solving skills. "I guess I've sharpened them. Certainly its a lot of fun."

## Teacher

Grace supports her teaching with word processing and record-keeping on the computer, use of e-mail, and beginning use of the Internet. Grace rarely works directly with students and computers in her role as a Physical Education specialist, although she has started to informally introduce e-mail to small groups of students. Grace has long since figured out what to do with successive classes of children for Physical Education, as she wrote the curriculum for the district. The intellectual challenge of problem-solving on computers and the social reward of being helpful in her school are big pluses for Grace.

Eloise, the library media specialist at Cascade Park and Grace, the Physical Education specialist at Lakeland, both think that students see them differently because of their roles as Seed Teachers. Grace says, "the students are quite surprised that I know

about computers. 'You're the computer person?' They don't realize that physical intelligence and mental intelligence can be both in the same place."

I ask Grace what she will be doing in five years and she responds in a completely personal way. She knows she will not be a Seed Teacher when her term is up, so she thinks of the extension of her job as an elementary Physical Education specialist. She is a fit and athletic woman, giving the impression to students and adults of being fully in charge of any situation in which she finds herself. She answered, "I guess it all depends on where the district goes with PE and computers. My body is getting old and its getting harder and harder to get off the floor from playing some game with the kids and then you don't bounce back up as fast as you used to." She is upset with the district for the drift to local decision making about configurations of specialists in schools. "If they eliminate specialists, like they are kind of hinting, or letting the teachers vote, I'm getting out. I would maybe try to get into a classroom, maybe get into a regular fourth grade or fifth grade classroom." Grace said in several conversations that she would like to run a computer lab, if it became a possibility. She likes teaching students and teachers and has ideas of what would work.

## **Helper**

### **Troubleshooter**

For some Seed Teachers the coming of the local and wide-area networking, plus the increasing numbers of computers in the building changed the nature of their obligations and proved to be too much. For Grace, the shift to technical problem-solving was the beginning of her interest. She watched previous Seed Teachers "run around and get a bunch of programs, and show programs. Well, I wasn't into programs. Then I watched as it slowly changed, and they were talking about getting e-mail on and stuff like this." With her interest piqued, Grace finally took the job because of her contrary streak and her desire to rise to a challenge. "I was warned not to take the job this year because it would be just terrible, with getting everybody up and running on the network. So I thought, 'OK, I'll take it.' Rory said it would just be terrible. I figured that it wasn't any big deal and it hasn't been the terror." Grace enjoys the work and works well with the high school TEK student, Manning, who is assigned to Lakeland. "The TEK kid that we have is great. The year before, we were constantly trying to find the TEK person and trying to get help. Well, he was over-extended. This boy is here every Monday and he reports to me. He also writes a letter when he's done on what he's doing and all that has really helped. So everybody is more accountable. And he is also a extremely reliable young man."

Grace feels that she knew ahead of time what the job of Seed Teacher entails and that she is doing just fine. Grace describes the situation at Lakeland, "Jack and I have split it up so that I will get peoples' computers working, solve their problems of why the printer doesn't print type of thing, because I have time to run around." Jack does curriculum-based work and Grace does a lot of the troubleshooting. "Jack and I were helping people before we were Seed Teachers, that is why we became Seed Teachers. I like the challenge the computer gives me to solve a problem and I like helping people to show them how easy it is to fix something. And hope that they pick it up and use it."

Grace describes her helping philosophy. "When the teacher sends you an e-mail or talks to you on the phone because e-mail is down, I think it's real important to respond back as quickly as you can. At least, on your prep time, get down to them and get their problem solved or tell them that you're working on it. Respond back immediately. People get real frustrated when they have a problem and they don't hear, and that's true with anything. 'Is anybody listening to me? Help!'" Grace has said on other occasions that she wishes she could continue to be the Seed Teacher. It is a role that suits her and she cannot imagine who else in her building will do it as well. She does understand that it is a learning role, though, so she would think it fair to give it up and she would be helpful.

It is a puzzle. "I think if the people are doing a good job, they should do it. It could very much stagnate a program if a new person really took it just for the money or was not as efficient and helpful, and all of a sudden nobody's got e-mail, nobody can understand why their printers aren't working and this person does not have the time and the energy or really the interest. I would really like to see it change. The Seed Teachers can continue, if the principal chooses. And I would hope that principals now would start looking at what they want out of their Seed Teacher program and how they are going to get it. I wouldn't mind giving my job up in a year to somebody that could continue or find a new phase of it and bring everybody up into that area. You know, there's so many different areas here. I would not like to see somebody take it that does not have the knowledge and certainly doesn't have the capacity or energy ....it's like running out of gas. I don't want the program to run out of gas. I want this to continue and grow and grow and grow and everybody, I would hope, would be someday talking to the world." Grace began by saying the program should stay the same, but she clearly does not want to turn over her job to people like the two who had the job before her. She also has thought about the help teachers need, the changing nature of the help they need and who might provide it.

Grace wants to do more than she is able to do. There is "not enough time to complete my goal of helping people." Time was the problematic variable for all Seed

Teachers. Grace continues her point, "I could have so many more people up on Internet and using it like a teacher should be using it. But I also don't feel like I should be here until six or seven o'clock at night. I've got a life." She thinks in modest terms, "I wish they had given the Seed Teacher a half hour during the day, to accomplish all the other things I would need to accomplish." Grace goes on to describe many specific things she would like to do. Get the Apples and the Commodores running. Learn how to use them and show teachers how to use them as learning stations. Find the educational assistants, and specialist teachers who are still afraid of computers and get them up. Figure out why the extra DOS machines on her desk won't work. "These things are all time consuming." She wants teachers to work one week extra. "I would really like to see the District lay out some money so that the teachers attend computer learning classes in the morning and then they are released to work on computers in the afternoon for their classrooms. A whole week long intensive computer course." Even as Grace wants this to happen, she knows that teachers are sagging under the demands of restructuring the schools on site-based teams and that learning to teach with technology is just one of the many things they want and need to do.

### **Inservice Provider**

Jack offers mini-classes and Grace does one-on-one inservice sessions with classroom teachers. Grace says, "I would hope that I've gotten more people excited about using computers. When I'm there, correcting some problem, I try to give them a little bit of extra knowledge on something. 'Oh, by the way, have you seen this?' We help more people learn more things faster." Grace likes being a Seed Teacher and counts progress with every bit of help delivered. She reiterates her point "it's attempting to bring the teachers into the modern world. It's a noble effort. Like Internet. I don't know of anyplace that you could really bring this many people online without it bogging down. Maybe a private company like Microsoft, who could hire ten million substitutes and then bring everybody else in for lessons, it would work better. But this is as good a way as any to try to get these people up without any extra money." She wishes there were a better, affordable way to train teachers, but feels like the Seed Teacher program works pretty well for a program that does not cost very much.

Grace thinks of the Seed Teacher as a teacher, helper and learner. In Grace's discussion of the documentary she would make about the program, it is clear what she considers her job to be. "I would show the Seed Teacher teaching three people a program at one time. I've been the most successful with one-on-one, so I would show being one-

on-one with the other teacher, taking them through various programs, and letting them feel more confident. Particularly with some of our older teachers, who are very nervous about even turning the thing on. You should be able to sit down with them and walk them through it, just little bits at a time. Go on maybe five minutes, not a one-hour class, unless they want it." She describes her image of herself and how it looks. "Five minutes here and five minutes there... kind of running from room to room to room, is what I end up doing. And helping people, prodding them along and kind of seeding them type of idea. And they seem to be very grateful, so you could show something about people wanting to learn, but having a glitch and there's somebody right there that can get them past that spot and then they can keep going."

As she continues to describe her movie, Grace is frustrated "that there is not enough time or money or what they really need." Grace recommends very modest changes to the program to make it workable, "whether it's an hour a week, or a half hour a day that is set aside purposely, so the Seed Teacher can do something, whether she needs to help people or whatever. I would like to design a program where I teach one or two kids in each classroom." Grace would like to train the equivalent of "AV kids" to help in each classroom. "You would have to have pictures of us attending classes and us attending the Seed Teacher meetings to generally get information, as well as conferences."

Grace thinks up ways to teach her peers and she observes how they learn, "like kids. Hands on. One-on-one and ... get in there. You know no one wants to be lectured or handed a book to learn." Grace acts on what she believes and regularly prepares short, specific directions for teachers and students pertaining to operations they will want to do. She does not interact with them until they have tried the procedures she has given them. She targets specific teachers for short in-person lessons and always slips in one more skill that she thinks will interest them.

### **Technology Coordinator, Messenger, Decision-maker**

Grace and Jack work on all technology issues in the building. They listen well at meetings and debate long and hard together about how best to spend various pots of money as they come available. They would like to be part of the building Technology Committee, but neither is willing to meet at night, when the parents are able to meet. They are comfortable handling technology issues as a team.

## Relationships and Status

Grace is the only Seed Teacher in this study willing to step right out and say she is a leader. She is a building leader through her longevity in the school and district, her self-confident manner, and her service to the school. Because she used to work out of the district office as the Physical Education coordinator, she is less awed by district directives than her peers. She understands the shortcomings and shifting nature of the district office staff and their mandates and directives. She is willing to speak out on issues and is secure in her position, so evaluations and hierarchical chains of command are not intimidating to her. Grace takes a low profile in staff meetings, as her power in the building comes from her mobility and ability to mold and shape opinion behind the scenes.

Broadening relationships in and out of the building is a good aspect of the job for most Seed Teachers. In her building, Grace feels like she has been able to be helpful to all of the staff at her school. Her relationship with her principal sounds more adversarial. "The principal gives me stuff to do. She likes to distribute work to everybody else and I distribute it right back to her. She now knows that I really run the building and that I know a lot more information than being just a PE teacher, because she didn't want me to be a Seed Teacher. PE teachers don't know anything and that it should be a classroom teacher. Jack refused to do it with anybody but me. I don't believe she thought that a PE teacher would know anything about computers." Grace is a strong person, steady and outspoken. She speaks frankly and expects to be treated in kind.

A nice feature of the job for Grace involves contact with people out of the building. She feels "closer to Joanie" (Technology Team Leader, who used to be her secretary) and says "it's nice to get back in touch. PE teachers aren't allowed to go to meetings. They're always English and math people and there's never any money for us. So getting out and going to a meeting where there are a variety of people from the district is nice again, because I was used to that, from being a PE coordinator. I used to be able to go into all buildings and know almost everybody. So that's nice to get to know people again." Grace likes using electronic mail, telephone and personal contacts to track down information. Her world comfortably expands to include people all over the district.

Grace and Jack talk together about the best ways to infuse technology into the curriculum and they debate the features and expectations of the Seed Teacher program. Both complained that the teams preceding them were not very effective and stopped helping when their terms were over. Grace is the most blunt. "It sure would be nice that the old Seed Teachers are supposed to be helping out, which they're not. At least at our building."

She and Jack wonder what would make people keep helping or how the district could fix the program. Grace has been with the district through multiple levy failures, many reorganizations, and numerous schemes for school improvement. More than the other Seed Teachers, Grace has an awareness that the "District" consists of people like herself, just trying to do a job.

Grace talks through who might evaluate her. Her principal is not on her list of considerations. "There's not a real person in charge." She realizes that none of the technology people in the central office are evaluating her. She continues, "I think everybody always evaluates people. If they're getting paid for something. I think the teachers think that we're doing fine. They're definitely not asking what does she do for her money." Grace is sensitive to the charge about taking the money and not doing enough work for it, since it is a charge she and Jack continually made about the previous Seed Teachers, and most likely it was a point of gossip in the building. She judges herself by the standard she applied to the other two and she believes she and Jack come out well.

### **What Helps and What Hinders?**

Grace is helped by the flexibility in the program. She was not interested in being a Seed Teacher when she thought that all they did was show curriculum programs. She likes problem-solving and organizing a system for addressing a problem. She and Jack mapped the school, identified all of the computers, worked with the librarian to catalog and mark each one. They matched computers with purchase orders and teacher memories to track down missing or unknown computers. Grace likes bringing order out of chaos.

She likes being out of the building for meetings and likes being in touch with administrators and teachers around the district. When she was the Physical Education coordinator, she was the connector for a whole network of people. It is a role she likes.

The Seed Teacher work and status were beneficial to Grace in the hard years of her husband's illness and death. Computer problem-solving presented an intellectual and time-consuming challenge, at home and at school. The task of working with individual teachers kept her busy and personally connected in positive ways with her colleagues. She was stimulated intellectually by the challenges presented by coordinating technology issues in her building, and personally rewarded by the relationships she developed with staff members. Elementary specialists are often isolated from other teachers, so the Seed Teacher role gave Grace an enhanced and more connected role with her teacher colleagues.

The district does not have any plans for former Seed Teachers and Grace is frustrated by what she will do next. She believes she and Jack are doing a good job and she wants to continue doing it. She thinks it is good for others to have the experience but she thinks that total learning stagnates if beginners keep taking it on. Grace would settle for half hour a day to do this job. She wants more time during the school day to help people. She knows that it is unlikely her current principal, Susan, will allocate money to her for such a role.

### **Jack Compton-2nd Grade Teacher**

#### **Computer Hobbyist and Kind Guide**

#### **Portrait**

Jack Compton, 50 years old, is a veteran teacher of 22 years. He is in his 17th year as a second grade teacher at Lakeland Elementary. Jack's is a proper classroom, with children in rows, rising to greet each day and each guest formally and in unison. The back wall is lined with brightly-colored Commodore computer screens, each with programs written by Jack. Directions for the day are written neatly on designated parts of the blackboard. The school day is broken into predictable segments, and children work independently through their daily work assignments. Jack meets at a back table with small groups as others work on their own. Occasional parent volunteers work with small groups of children or help with correcting papers. The room is jam-packed with materials around the edges. Jack is a kind, soft-spoken man who holds the classroom in tight control. He speaks to the students gently and formally. He knows each student well, continually worries about each one, and works to help them succeed.

Jack is in the first year of his second Seed Teacher term. He was a Seed Teacher in the first five years of the program, when he was charged with doing model lessons for teachers with Commodores. He loved learning about computers and working with teachers one-on-one, but experienced great stress teaching for his peers. He developed high blood pressure and was advised by his doctor to stop being a Seed Teacher. He did not, but still is nervous about teaching students in front of his peers. He was asked this time by his principal, Susan, to be the Seed Teacher. He said he would accept only if Grace could be his partner, so Susan took them on as a team. Jack and Grace like their partnership and often declare it to be good and productive. Grace does the daily trouble-shooting and Jack researches programs and demonstrates them to fellow teachers, along with a share of the

troubleshooting. Jack's gentle helpfulness buffers some of the blunt responses from Grace, which are intimidating to some teachers.

Jack describes his computer-using skills as "minimal", but he is an accomplished user of computers for several purposes; word processing, databases, spreadsheets, hypercard projects, e-mail, using online data sources, and maneuvering through online listserves and bulletin boards. He loves to puzzle through computer problems and he likes to show teachers new things they can do with their computers. He is teaching his second graders to program the Commodores, and wishes he could take more time to understand how to do the same with Macintosh computers. He reads computer catalogues and magazines and is actively trying to restrain himself from ordering CD-ROM disks, programs and computer doo-dads in the mail. He has organized his classroom so that all of the teaching materials of 22 years are identified, classified and retrievable in several ways on a newly created database and in his reorganized files and shelves. Jack is honored to be part of a new committee writing the technology plan for the district.

### **Learner**

Jack has been a computer hobbyist since the days of Commodores. He programs the bank of Commodores in his classroom to create various language and math problems for his second graders. Like Grace, Ned, and Eloise, Jack comfortably uses computers and talks about their use in straight-forward, non-emotional language. Jack thinks about what he can do with the machines and how he can do it.

When Jack drew the Seed Teacher program, it was in the form of a web, with the words "Seed Teacher" in the middle connected to learning opportunities and duties and roles. He writes in these elements of learning:

1. Many classes. Inservice.
2. Through example. ("of course, this may turn a lot of people off. I have already received something that I can only express as just sort of maybe an intuition or vibe of, 'are you trying to show us up?'"")
3. One to one. ("I do a lot more of this than anything. You go, when somebody has a problem and that's when they want to learn. That person is open to listen to everything, where if you did it in here (points to inservice), they might catch a piece of it, but they wouldn't maybe ever use it.")
4. Reading
5. Spending money.
- 6...to be a teacher with computers. Right. With my class.

7. Cajole ... because you, you try to get people to do things.

8. The big search. Search for time. And some money, (but we haven't really run into it yet. We've got the money.)

Jack drew mostly elements of his learning, and then he added in how he helps in his school and what he does with students. He learns through classes, and reading. He helps fellow teachers by offering classes, and by modeling teaching with computers. He serves the school by making decisions about purchases, and cajoling teachers into learning.

Jack hopes for "more universal usage of computers in the classroom, and individual teachers feeling comfortable with using their own computer, not only in teaching, but doing things with them. I think everybody would be excited by computers if they just...." Jack enthusiastically describes the discovery with his son of a resource in the public library that lets you find the name, address and phone number of anyone in the country. He was also excited about hearing that morning on the radio about "a CD-ROM in which you are able to interact with the movie. The whole interactive thing...wouldn't that be neat?" So Jack wants to see more universal usage of computers in the classroom, and more individual teachers using computers for their own use. "And I hope that we also have spread the word of some new technologies to people." He hopes that all the old Seed Teachers continue to work with their own kids. "Everybody I can think of here, that has been a Seed Teacher, continues to at least work with their group in more of a computer way, than people who have not been Seed Teachers."

Jack is a confident and enthusiastic learner. "I'm someone who takes a lot of chances, and I'm not afraid to do new things. I sort of trust that I can't destroy anything. I get frustrated too, realizing how much there is out there I just don't know. I'm inquisitive. I'm open to new ideas." Jack hesitated to be a Seed Teacher this time around because "I really do believe in the first philosophy of let's get everybody doing it. But technology has changed so much." He thinks that others should be Seed Teachers for their own learning, but he knows he is learning a lot and is helpful to his school. It is a dilemma for him.

As a learner, Jack was critical of Seed Teacher meetings because he did not understand what was being discussed. Barry and Sylvia talked of similar frustrations. "Grace and I were at the first Seed Teacher meeting, and some things were said and we were looking at one another, because neither of us knew what somebody was talking about. I don't know who everybody else is, but I do know some of the people, and they were also in the dark. And nobody wants to admit he's ever in the dark when you're in this whole group, saying 'would you run that by me again?'" Jack expresses a common opinion among Seed Teachers, that they do not always know what is being discussed. The

interesting thing is that grown adults, veteran teachers, confident learners do not stop the process and get words explained, even when they have the feeling they are not alone in being confused. Instead they say nothing, and then are annoyed with the people running the meeting.

Jack would teach Seed Teachers differently than the ways chosen by the district. He refers to lessons during two seed meetings. "When Ace presented *Logowriter*, we each had a computer, but he went through it so quickly. And nothing ever was explained to me." The math adoption committee adopted the program *Logowriter* and Ace Rockwood was contracted to write a manual for teachers. The lesson for Seed Teachers Jack refers to is the only training provided district-wide, and the plan to have Ace's fourth graders teach students in other schools never materialized.

Jack was critical of Ace's presentation because there was no introduction, no history of the adoption, the lesson was too speedy, and there was no follow-up. He did think it was very important for all teachers to have a computer and he points to another meeting as an example of what not to do. "I'll just give you my reaction. I don't want to criticize but..." Jack describes a Seed Teacher meeting in which elementary Seed Teachers observed a demonstration of four primary-age word processing programs by technology specialist, Todd Everett. The plan was for teachers in all buildings to remotely access the administrative building server to preview the programs. Todd was unable to link to a remote server, and was thus able to show only a couple of the programs. Jack was very disappointed, "We are the techies of the District and this is how we are doing this? We should have all been sitting at computers." Jack was worried because the very technically-able Todd was not able to access the remote server, so he wondered how the rest of them could do it. He also thought Seed Teachers should participate in guided, hands-on work with each program, if they were expected to similarly host teachers in their schools.

Jack wishes the presentations for Seed Teachers were organized as he would organize a class with all the elements he believes are needed; good set-up, teachers at computers, guided lessons and lots of time for practice. "The assumption is that the Seed Teachers are all-knowing. And I think people think that I should know an awful lot more than I really know." Jack has said that he thinks teachers should learn in a hands-on personalized way, and he believes the Seed Teacher meetings are not designed to work like that.

When Jack describes what he would design as a way to infuse technology in the curriculum, he takes a stab at several issues; mandatory versus voluntary inservice, adoption of materials, specialists versus Seed Teachers, who in the system can give

technical help, what to buy with limited resources, and how to persuade people to learn. He starts off with a clear declarative statement. "I think I would be very authoritarian and I would adopt district-wide things and mandate an elementary word processing program. Let's have a district-wide thing and so we can give district-wide inservice to the teachers. Apart from Seed Teachers helping here and there, and instructing here and there, let's do a real good in-depth job of inservice. People get excited when they see things that can be used well in the classroom, but it doesn't come very often. It needs to be sort of a continual kind of inservicing." He advocates meetings where specific groupings of teachers could come on a regular basis to learn. "Let's have something like, all the second grade teachers in the district are going to meet at Cascade Park and learn what you can do with a specific program, which is on all of the servers, because I mandated that every school was going to have one."

### Teacher

Jack supports his teaching with word processing and record-keeping on the computer, use of local e-mail, and beginning use of the Internet. Jack collected old Commodores, lined them up across the back of his room and is having fun again programming lessons for them. Students work through reading and spelling lessons. "When all the computers are on, it is fun." The old computers regularly break down and the number that work each day are put in the mix for student time and attention. Jack fixes them as he can get to it. Since Jack has moved the computers out of the back room, set them up in a row across the back, and made each screen a different color, they are visible from the walkway as people pass his centrally-located classroom. Jack is enjoying the commotion and interest they are arousing in students, their parents, and fellow staffers.

Jack loves teaching and describes work at Lakeland as challenging, tiring, rewarding, interesting, enjoyable and frustrating. He is frustrated that "everybody else is out buying *Hooked on Phonics*, because they realize their kids aren't learning how to read in school. What's frustrating is that we have to do the same thing over. What we tried before, that sounds pretty much like this. It hasn't worked, why do it again? Is it the time now because people say it's the time to team? Everybody's pushing us to team. We were teaming years ago. It may be OK for us old timers who say, 'well, hell, I'm not doing that and I'm going to do this, because we know what we're doing.' But these new people coming into the system, I don't know what they're going to do." Jack has been a teacher for a long time and has seen various innovations come and go. He comfortably uses a

variety of teaching strategies, depending on his group of students, and does not budge very much anymore in the direction of each new initiative. He is a very competent, traditional-style teacher, and a reluctant participant in site-based decision-making and curriculum reform.

Jack believes that being a Seed Teacher pushes him to being a more visible teacher with computers. His job is "to expose the people in the building to district-wide adoptions as far as software ...to try to excite people into using some of the new technology... And to help people get on board ... and help answer questions, trouble shoot. Well, it does get you more involved with doing things with your own students. You really get more into the mind set of it. Rory and Morgan have both said to me this year, 'last year we were doing all these things with our kids in writing and computers' ... and they don't do it as much now. Isn't that interesting? I think part of it is you just feel that you need to be doing these things to show other people, 'yes, this is possible.' Sue, the teacher next door to Jack, was inspired by him to order laserdisc kits on dinosaurs, learn to use the barcode scanner, and "she asked the science docents to find her a paleontologist. So she's over there with Sabertooth tiger teeth and the laserdiscs. Now that's interesting, because maybe she wouldn't have tried that."

Jack is having a difficult time figuring out how to be a classroom teacher and a Seed Teacher. "It does take away from the time that you normally use for planning for your class and correcting things. Being with your family. It all sort of piles up." Jack's time solution cannot last. "You still have the same amount of correction and planning to do. So you cut it from something, and I just stay up really late. Which is not good either. What happens is if I'm up past 11:00 p.m., I get a second wind and I can't go to bed until 12:30. So, if I'm up to 11:00, doing correcting and things, because I've been doing computer things after school, then I'm up until 1:00 a.m.. And then I get up at 5:45 with four hours sleep ... I'm not a morning person. But anyway ... it catches up with you." He thinks about where to find more time. "Time has to come from somewhere and a solution isn't for it to come from the school day, because it would require some type of lesson plan writing and that's too time consuming. I'd rather teach. I will probably take my Seed Teacher release day. I don't know. It's twice as much work to write plans as it is to teach. Is it worth it?"

Jack could have retired during the year of the study, with a special state early retirement option. His wife and he are both teachers, one of their two teen-age sons is still in high school, and he cannot afford to retire, or imagine himself retired. I ask him what he will be doing in five years. Jack pauses for a long time and then says slowly and softly,

"yes, I will be a teacher in five years. I like this age group...so much happens. Every year is different. I like to see the lights come on. Children come a long way. Some are way down there." I ask him to comment about the future. "Teaching will look pretty much the same. I hate to say it." How will his classroom look? "More technology in the classroom? I'm not sure. We are remodeling the year after next. They will gut the place. I would like to have more up-to-date computers. I have the CD-ROM. I would like to use much more." Jack reads computer magazines such as *The Computer Teacher*, *MacWorld* and *MacUser*, scans newspaper articles, pays attention to the news, and has participated in discussions about computers in schools and research findings from the Apple Classrooms of Tomorrow. He works on the district-wide committee writing the technology plan for Vista Schools and has heard several presentations by various educators and business visionaries. Yet when he projects his teaching five years into the future, he imagines it to be virtually unchanged. The most he hopes for is a better CD-ROM and more modern computers.

I ask Jack to imagine how schools could be in ten years. "I'd have money available, grand as this sounds, for people to have as many computers in their classroom as they'd like. And I'd have money available for CD-ROMs, and this technology where they can hook computers into TVs. As a matter of fact, I would like, for people who would use it, a big screen TV that you could have in your classroom and you wouldn't use the PC Viewer. So you could do something and all the kids could see it. Or the kids could actually come up and do something on the computer and all the kids could see what that kid is doing. That's probably all pie in the sky. Who knows?" This vision of the future projects forward all of the basic structures of schools and simply adds technology to the rooms of the teachers who want it. Jack has been through many years of reform talk and this is how he imagines things could be when he really lets loose.

## **Helper**

### **Troubleshooter**

Jack and Grace keep a checklist of what to do with every teacher and every computer in the building. Jack says "just from the number of requests, that teachers feel that there is someone they can go to. They're not just stuck on their own...to say 'let's turn this computer off and never get back to it.' They feel that there is someone that they can go to for help." Jack has been assisting his peers since he was first a Seed Teacher, but he likes working with Grace's help. The troubleshooting is personally rewarding to

Jack from the problem-solving angle and because he likes positive feedback from his peers. More so than Seed Teachers in other buildings, Jack and Grace regularly work with the secretaries and other support staff, as well as teachers.

### **Inservice Provider**

Jack describes his half of the Seed Teacher job with Grace as "I do the inservice on the programs." However a look at his activities each week reveals that he helps teachers a lot with their machines and their work. Jack enjoys the pleasure of helping, "I do like it when I'm able to help people solve problems that they're having. I do like it when I have been able to show somebody something that they can use and they will use it, like these *Creative Writer* banners."

Jack has offered several inservice opportunities to Lakeland teachers. He is usually disappointed in the turnout and has thought about how to do it differently. "I think teachers need to see a reason first for learning something, or they will not learn at all. I think teachers do not learn technological things well in a large group, unless each person that you're talking to has a computer. People can't sit and listen to things without trying each thing you are saying, and understand it. You want people to try it at that point. 'OK, let's open up *Creative Writer* ...And let's go to this.' That's why I really envy the schools that have labs. You can then go in and take the PC Viewer and do some things. Even if it's a group of five, at least those five each have a computer to work with. Then if they have a question as they are doing it, they can ask you then." Lakeland teachers have designed a computer lab for the remodeled school. Jack's wish is a common one among the schools without labs, with Vintage the notable exception.

Jack continues to think about the context for teacher learning. "I think that it has to be presented to the teacher by showing them how it's useful in the classroom. If it's one more thing that they have to fit into the classroom, it's not going to work. They have to be enthusiastic about whatever they're bringing in before they start dropping anything. When you are a beginning user at something, you're not secure enough in it's value to let those things go that you've been doing all along. I think it has to be presented as 'this is how you can use it, if you are now writing a weekly student letter, here's how you could do it on *Creative Writer* . If you're doing writing workshop, you could do it this way." Jack keeps offering various classes and tries to be satisfied with minimal participation.

Jack thinks about what happens now compared to what he envisions. "I think it would be more infused. It's sort of a hodge podge right now." He describes a situation which he considers typical in Vista School District and starts with the kind of example that

buffaloes most educators who try to impose some order on technology purchases. Jack and Grace attended a Seed Teacher meeting at which elementary word processing programs were discussed. Schools were thinking of buying or had already purchased different programs. District technology staff hoped to research various programs and solicit teacher opinion on which one to adopt. It was hoped that the district could buy one program at a more economical rate and then provide inservice.

Jack and Grace followed directions. They showed their colleagues the various programs. While this effort was underway, a new program came on the scene and a great buying opportunity came up for one of the programs under consideration. Local software company Microsoft offered an elementary word processing program to teachers at a very low price if they were one of the first callers. Jack was in a bind. Jack says "I was almost afraid to push *Creative Writer* to people, and that was coming for five dollars. But when I heard about the bargain, I said, 'Come on, folks. Call that 1-800 number.' Many of the staff did call and order the program. So all of a sudden, Todd comes on the phone and talks about this other deal (for *Word Weaver*) and says, 'I know some of you already have your word processing programs.' I thought we were making this decision later on. Why do people already have these? I guess because nobody would wait." Jack and Grace have tried to follow what they thought were clear directions and two opportunities got in the way of orderly consideration and buying. The \$5 opportunity was too good to pass up, in bargain-hunter Jack's eyes and the *Word Weaver* deal was another good bargain that happened quickly. Many decisions happen like this with technology and it frustrates Jack and many others. He says, "Maybe Grace and I are more conservative. We have been mulling over and going back and forth. What should we do with this ... going to pool things and maybe get a discount. And here I hear a week before this thing goes off that we've got to come up with the money right now. Well, you see, that's like hodge-podge. It was just sort of a last minute, not planning, just ... all of the committees and everything fell apart."

Jack is on the district committee trying to write a short and long-range technology plan for the district. He is aware of the issues and the difficulties in making concrete plans. His frustration is high, however with the word processing program events. He understands the shortcomings of mandates and invitations as he talks through a plan, "I think that some type of a software review committee ... It would be a District committee that would have recommendations but not mandates of other than basic things that you'd mandate for everybody. Now I have to tell you, that something was mandated for us. Somebody made the decision that everybody was going to get *LogoWriter*. That was an

authoritarian decision. Like I just said that I would make and yet I resent the fact that somebody made it. But then we haven't had an inservice either. Maybe we'd like it. I know I would like to play with it. And I have put it on my machine at home." With two examples, a mandated program from the math adoption committee, and lack of mandates about elementary word processors, Jack has presented several specifics on hard issues in school use of technology. Jack does not summarize, but he has given the pro and con argument on several questions. The district is working on site-based decision-making. Teachers are sensitive to mandates they do not approve of, but they are also frustrated with the consequences of each building being on its own to make decisions. None of the Seed Teachers take a clear stand on how to resolve the tension.

Now he imagines trying to convince his peers to learn. "I do some things with *Logowriter*, but I can't imagine me trying to convince the intermediate grade people to do that, when in fact they have a real reluctance to use even word processing. Because word processing, 'come on folks, this is the 90s.' I think I'd do what has been done. I think getting teacher stations was a very good thing, even though some people are now just getting into using them, and they've had them for a couple of years. Networking is very important. One of the first things I would do is to hook up all attendance and things to the network, which would force them to use it and hopefully it would be such a procedure that it would be very simple. Most people now switch it on to see if they have E-mail. They weren't doing that before. They sort of feel, 'gee, if I want to know if there's a bulletin, I'd better...' Susan doesn't give a bulletin any more, it's always on E-mail." The Vista School District thought that all school functions would be online by the 1991-92 school year. It was the TEK plan to invite teachers to learn with their own computer workstations and then follow rapidly with mandatory use by virtue of necessity. The reality of online business and communication has been slower coming than hoped.

### **Technology Coordinator, Messenger, Decision-maker**

Jack and Grace felt like they should be on their building technology committee, as did their principal, Susan. Neither was willing to meet at night, however, and that is when most of the meetings were scheduled. They hope to reschedule the committee meetings. This is a typical bind when teachers and parents want to work together on committees. Jack and Grace definitely coordinate technology issues in the building and make all of the major decisions. The principal and library media specialist follow their lead.

## **Relationships and Status**

Jack reflects on his relationship with his peers now that he is a Seed Teacher. He says he gets "lots of positive strokes." Regarding his principal, "it has gained a certain amount of respect for me. She comes to me a lot with technology types of questions or relies on me. Well, that feels pretty good."

When Jack thinks about being a Seed Teacher, he is somewhat resentful of the attitude of some staff toward him and his time. He eases into this point and lowers his voice, "I think people should feel free to call upon me. Well, we won't talk about money, the thing about Seed Teachers and money, but some people just think you're on call for them." He snaps his fingers. "Because you are getting paid as a Seed Teacher. What they don't realize is this is approximately one per diem day for me, per month, that I'm being paid. Actually, I think I'd get paid more per diem for one day than I get salaried as a Seed Teacher for a month. If you are a Seed Teacher, it's a great responsibility. And a greater honor than you're being paid for." Jack laughs and continues. "It's incredible to me to think of all the things people feel you should be able to do. If they have a problem, they want it solved right now. Well, I don't know everything. But, the assumption is you do."

Seed teachers are rarely sure if they are completely doing their job. Jack thinks "it has to be internal. Nobody tells you. I evaluate my performance all of the time. I try to find time for people. I give up on things I would rather be doing. People are very appreciative. The things Seed Teachers do are nebulous. I take on as much as I am supposed to. We do have an effect in this building." Jack is willing to say also that he is a teacher leader and he sees his leadership coming from his skill and services.

Jack has thought a lot about Seed Teachers and former Seed Teachers. He describes a former Seed Teacher who has just taken on a second term at another building. "Kate said it was so nice being back. Why isn't that done more? Why don't we bring Morgan and Rory back? Involve June? They dwindle and they don't feel they have anything at stake. It would have been nice to have old Seed Teachers at the Seed Teacher meetings. June was very willing to go to that presentation of the technology consultant. It would keep them involved because I think what happens is that after the year is over with, its over. It is very demanding job, I knew that going in. I'm lucky I have some knowledge, some of the people are new like Sylvia, who said she knows next to nothing. I have people coming to me with all these questions that Grace and I are pouring through books looking for answers, so someone who doesn't even know what book to go to, it

must be really, really hard. I don't know if it works in other buildings like it does here, but it is like once their term is over, that's it." Jack knows that he continues to help and he is frustrated that all do not.

Jack keeps puzzling through how to keep former seeds involved. He knows the Seed idea does not work if people stop helping and learning when their term is over. "It's really hard to call upon some of these people, though, who are former Seed Teachers, because they don't want to use any of what they've learned. They don't want to take the time to discuss things that they might know. It's like a thing from the past...I was paid to be that before and now I've got this job to do every day. How do we keep these people involved? Maybe these after-school meetings where you invite them and you pay them to come, but you don't have to pay for a substitute?" He thinks what else would work, "some tasks, something to get them, to keep them involved. That would work with some people. I think it just has a lot to do with personalities. Some are just the kind of people who say, this is now and that was then."

Jack feels there is a continuing obligation and he wonders what would make it more clear. "I think it was clear at the beginning (ten years ago) and it seems to me at the first meetings the whole philosophy behind this program was discussed. I don't think it was discussed this year, was it?" Because Jack believes that the metaphor of a seed and a garden are descriptive of the program, he understands that each plant cannot die after its turn if the whole garden is to bloom. He thinks that new Seed Teachers should understand the philosophy and be expected to carry it on.

### **What Helps and What Hinders?**

Jack is helped by his own experience and background. He took on the job from a position of strength, after being asked by his principal, Susan, and saying he would only do it if Grace could. He feels well supported by Grace, because of the time she takes, the work she from him, and his personal friendship with her. He likes the position of respect afforded him by Susan. He likes looking at new software and tinkering with hardware. He is challenged to solve problems he doesn't understand and he sticks with them. Both he and Grace like learning from and with TEK student, Manning. Time with Manning is late on Monday afternoons so it automatically makes long days for the three of them.

Jack likes being an expert in his building although he doesn't like to stick out in general. He likes the fuss being made about all of the computers in his room, but he is sensitive to the unspoken criticism of his peers. Because he is a comfortable, confident

teacher, he is challenged by how to more completely use computers in his class. He sees that he should be model user of computers as a teacher and tries to use computers a lot. Jack would do a lot more if any time were provided. As it is, he stays at school often to work on Seed Teacher jobs. Jack is troubled by unclear directions and desire to bring order to the chaos of computer purchasing and decision-making.

Perhaps because he is working on the district-wide technology committee, Jack thinks aloud about the best way to help teachers and schools. According to Jack, buildings and the district benefit because of Seed Teachers, "they have more knowledgeable people, a more technologically knowledgeable base and you have more expertise just on the site." I asked him about the drawbacks of the program. Jack was succinct, "I don't think there are drawbacks. I'm thinking of the Seed Teacher program or nothing, you know. I honestly cannot think of a drawback because, if we didn't have something like this, there would be many, many people, I'm sure, in many, many buildings who would have never turned on their computer. Or done anything with it. And see, this program too has gotten people hooked, like Sylvia." Jack sat with Sylvia at a Seed Teacher meeting. She talked to him about what she does not know and how she feels lost and overwhelmed. He uses her as his example of a fledgling computer user. He would be surprised if he observed her in her classroom. Reflecting on the Seed Teacher program, in all of his years in the district, Jack has seen programs come and go. He is convinced that this is a good one.

Jack's description of scenes he would shoot in a documentary about the Seed Teachers, illustrate what he consider to be the important elements:

- \*"going to a classroom with the TV blackened and discovering the monitor is off ... the little trouble shooting situations.
- \*the classroom of some Seed Teachers and what they're doing with their own classes.
- \*Grace sitting in her gym outfit at the computer typing, on the phone, show her using e-mail, because there is a lot of communication there.
- \*highlights of Seed Teacher meetings, picking up some tips, question and answer, where people are helping one another in the bigger group of Seed Teachers.
- \* Seed Teachers working with the TEK kids. It would be really important for other people to know that has worked.
- \*having people come to the Seed Teachers as technological advisors, like the principal comes and talk about furniture, upgrading memory or something.
- \*show parents and Seed Teachers talking about technology."

Jack's documentary ideas contain more elements of the Seed Teacher program than other Seeds mentioned, including several examples of learning, teaching, and helping.

### **Principal Role at Lakeland**

Lakeland principal, Susan Sutton, likes watching skills and specifics get shared among staff. "they learn from the Seed Teacher and it spreads out to the group. I think just that support and training that's available." She says it is critical that help is available fast from a person in the building, otherwise teachers would just give up when they are trying to learn something new. She believes the Seed Teacher position to be a benefit to the person experiencing it. "This is going back to Woodland too, but you have some teachers who have very limited experience and this kind of propels them into the world of computers. The Seed Teachers themselves get the experience and the exposure and the training and they carry that with them to their classrooms."

Susan likes the Seed Teacher program and she cannot imagine anything better. "I try to think of how, unless they put something else in place, we would deal with all the things that come up about computers. If the district hires somebody that goes around to the buildings on a continuing basis and answers all those questions, I don't know who's going to answer the questions or fix the glitches or honcho it. As individuals you can go grab somebody that you thought might know something, but right now there's actually a process in place and the teachers know who to contact and how to get help when they need it. I don't know what would replace that.

Susan does not mention that expertise builds up in the building and that this is a benefit. There are the fewest Seed Teachers at Lakeland as many have transferred or retired. Ned and Carin from Vintage used to be at Lakeland, as did Cindy. Susan wants someone in her building to take care of technology issues, regular in-building help. Susan came from Woodland where Ace Rockwood had been a Seed Teacher for six non-consecutive years. It is hard to build up expertise when the job is not rotated. Susan wants help for teachers and does not say she values the learning role.

### **Colleague Reflections and Building Survey Responses**

The library media specialists at Cascade Park and Vintage, both former Seed Teachers, are avid technology enthusiasts, who believe technology leadership is part of the librarian role in a school. In contrast, Carmen at Lakeland is a newcomer to technology.

She is a recently trained librarian so she knows and promotes the national "Information Power" standards, but the work of getting the library online and operating electronically is a major struggle for her. She is an advocate of the Seed Teacher program because it provides "somebody is there who knows more "than most people in the building." They impact the "30-second things they can help with in the building all the time."

Carmen cannot imagine being a Seed Teacher because she is "still at panic stage" in her own learning. Carmen sees the biggest barrier to learning with computers to be "Time. It takes an extreme amount of time to just play around, try things and figure it out. The best way to learn is to sit and fool with it." She likes having Seed Teachers so she can "be with a user." Carmen is not an advocate of the Seed Teacher role rotating among teachers, she just wants help when needed.

Teachers at Lakeland consider themselves to be mostly beginners. When asked to rate their computer-using skills, 52% said they were beginners, 44% said they were intermediate users. One person marked their skills as "expert", probably Grace or Jack.

Beginning Skills	Intermediate Skills	Expert Skills
52%	44%	4%

There are only two former seeds in the building, one who helps out when asked and one who does not, according to Jack and Grace. The rest of the former seeds have moved to other schools or left the district.

Cascade Park and Lakeland teachers mostly report having one student computer in the classroom, even though Cascade Park has a lab and Lakeland does not. This is because the student computer money which is being distributed over five years to most schools, was partly awarded in lump sums to Cascade Park and two other schools. Now both schools report only one computer per classroom, but students at Cascade Park also have access to a lab. Student computer use at Lakeland is low.

All but one teacher at Lakeland report the Seed Teacher program to be a benefit to the school. This person added a qualifier that it depended on who the Seed Teachers are. All teachers believe the district should continue the program and four of them want to be a Seed Teacher. When they rated how helpful Seed Teachers are to them personally, they were positive about the help offered.

Very Helpful	Helpful	Somewhat Helpful	Not Helpful
48%	41%	8%	3%

Teachers rate the following activities of Seed Teachers as most beneficial to the school; troubleshooting equipment and software, teaching programs, helping with e-mail, and being a liaison to the TEK students. Personally most beneficial are troubleshooting equipment, helping with e-mail, and being a software advisor.

### **Seed Teachers at Lakeland**

Lakeland has seen the exodus of most of its Seed Teachers, and a double term by one, so expertise has not built up over the years. Jack and Grace are doing an active, thorough job of organizing equipment, software, and training opportunities. They are helping most people on a one-to-one, informal basis. Jack offers mini-workshops which are sparsely attended, but valuable and well received by his staff. Jack and Grace make a good team. Both help with trouble-shooting, and Jack leads by example as a teacher using computer technologies to promote student learning. Both have experienced personal and professional growth, by dealing with technical and social issues.

The principal and library media specialist are not comfortable or skilled users of technology themselves, and their wishes for technology support focus exclusively on getting help when needed. Both would advocate paid specialists or non-revolving roles for Seed Teachers. The Seed Teacher role is big, difficult, and time-consuming, because of the large number of beginning computer-using teachers. All expertise is expected to come from Seed Teachers and it is difficult for them to find help or get a break. On the other hand, Grace and Jack would be considered average computer users at Vintage, so they are able to garner more respect and esteem from their colleagues at Lakeland.

## **Chapter 9**

### **Cross-Case Analysis**

#### **Introduction**

The Seed Teachers in this study were chosen because they represent a range of personal and occupational characteristics. It would be a surprise if they spoke with one voice, and they did not. Each Seed Teacher brings to the role his or her own blend of skills and attitudes, and makes a unique response to the demands and opportunities involved in being a Seed Teacher. As a group, they also expressed some reactions and needs in common. Focused studies of seven Seed Teachers and a broad survey of all current Seed Teacher provide a picture of teachers working in a volunteer role as learners, helpers and teachers. After presenting a thumbnail portrait of each Seed Teachers' reasons for taking on a difficult role, this chapter looks across the cases and identifies factors which support and constrain the Seed Teachers in their work.

Differences emerged across the school buildings and throughout the evolution of the Seed Teacher program including multiple visions of the role, various implementations in schools, the importance of building administrators, strategies for the involvement of former Seed Teachers, and the search for a balanced set of incentives and requirements.

The following analysis reviews the responses and observations of the entire group of 31 Seed Teachers and especially these seven teachers:

#### Cascade Park Elementary

Eloise Gallagher: Library Media Specialist. Confident Learner and School Leader

Cindy Rockefeller: Fifth Grade Teacher. Focused Learner and Lab Helper

Barry Christopher: Fifth Grade Teacher. Reflective Teacher and "Journeyman" Seed  
Teacher

#### Vintage Elementary

Sylvia Hayden: First Grade Teacher. Fragile Learner and Tentative Helper

Ned Masters: Fifth Grade Teacher. Founding Seed Teacher and Software Designer

#### Lakeland Elementary

Grace Harris: Physical Education Specialist. Confident Learner and Efficient Helper

Jack Compton: Second Grade Teacher. Computer Hobbyist and Kind Guide

### **Thumbnail Sketches: Why Be A Seed Teacher?**

Why would one choose to become a Seed Teacher? The role is fraught with difficult learning and problematic situations. Each Seed Teacher took on the task to learn, but each within the context of personal home and work lives. Personal and family issues mixed with professional ones in influencing each Seed Teacher.

Eloise found being a Seed Teacher a great way to extend her job as librarian. She developed a comfortable expertise with computers and it was pervasive in her life. She kept records for a sailing club and a professional library group. It was important to her to provide computers for her children and herself at home. She is confident, outgoing, funny.....and the role extended her leadership. The principal looked to her as the technology leader of the school. She organized classes at critical time in school and gained an identity as able to teach her peers. It was important to her to build skills in adult education in case she left public schools.

Barry wanted to finally take on a learning task she had been putting off for too long. She was a comfortable peer with other teachers, but mostly stuck to herself and did not make waves. She is not timid, just private and absorbed at home. She is in a phase of her career when the hours she can spend in school are limited by her desire to be at home with her young children, and her unwillingness to have them spend too much time in daycare. She comfortably lets the students in her class work on computers and one of her students worked on her home computer with her husband. She lives fairly close to school, but rarely comes back to school in after hours. She bought a computer for her home which she is proud of, but it became her husband's computer and she always has trouble with it and has to ask for help. She worked through her shyness customer help lines and feels she is was a more assertive learner now. Barry wants to assist her own children and her students be comfortable learners with computers.

Cindy's son was living away from home and her marriage had ended. She was looking for a way to spend her time productively and expand her skills. She wanted to get into the world of her computer-expert husband and connect with her son. She was brand new in her school and the Seed Teacher role allowed her to relate to her new peers. She could invest hours and hours of her personal time in the school in a way that would directly positively impact her peers. She let students use all of her computers and considered computer time an important part of what she provided for learners. She feels more powerful because she knows how to work computers and hopes she can run a computer lab after she retires from classroom teaching.

Sylvia likes to be out-front and on the cutting edge. She came to work at Vintage when it was perceived as an innovative school. She does not think of herself as only a teacher and quickly volunteered to me that she is a writer, and does not always intend to teach. She is proud that her friend at Microsoft thinks she should be part of a think-tank there. She was knocked off-base with the death of her husband, her children live away from home and her big house by the lake feels empty and lonely. She views her teaching work as a field in which to uphold standards of professionalism and she considers her teaching to be a labor of love and a gift she gives to the families of her students. She could not get a comfortable grip on the role of Seed Teacher so that she felt competent. Sylvia stated better than the others the role of Seed Teachers and the arguments for and against computer specialists in the schools, but she could not find a positive role for herself as a learner in contrast to the others in her school. Vintage hosts a split in level of technology skills, from avid enthusiasts to humanist resisters. Sylvia could have been a powerful bridge if she had talked it through and been able to relax and define specific tasks for herself in which she could succeed.

Ned was a founder of the Seed Teacher program and he believes in it philosophically. He thinks it is all about risk-taking. He sees the role as a learning role and he believes that when he works in a service role he should be compensated. He is paid extra to be a helper. Ned had a disconnect with many of his peers and neither he nor they were inclined to work on it. They wanted more from him in the way of time and specific lessons, and but his schedule did not allow it.

Grace wanted to immerse herself in a new task. She needed to occupy herself through the critical illness and death of her husband. She hoped for personal renewal and has some hope for a different job in the future, managing a computer lab and coordinating student computer activities in a school. She is personally stimulated by the problem solving and enjoys very much being able to interact with and help her fellow teachers at Lakeland.

Jack had been a Seed Teacher before. He always was a sort of computer expert in the building and helped people when asked specifically. He is sensitive to criticism and wants to be accepted by his peers. He is very comfortable with his own skills in the classroom after 30 years and aware that his job is secure. He took most classes offered in district. He had presented some of his computer projects at a few staff meetings, but was nervous in front of his peers. Jack enjoyed being a Seed Teacher, working and gossiping with Grace, and helping other staff members. He is tickled by new technologies and likes

to figure them out. He enjoyed recognition among parents and liked the principal deferring to his opinions.

Seed Teachers take on an extra role in their buildings which is challenging. They all view it as a big commitment, and move things around in their personal lives to be able to accomplish their Seed Teacher tasks. Features of the program affected them differently and supported and constrained their learning, helping and teaching.

### **Supports and Constraints for Learning**

The district expects that Seed Teachers will learn to use and teach with computers, then help their colleagues learn, so that eventually all teachers will help students learn. Seed Teachers agree to take on extra responsibilities in exchange for opportunities to learn. They do not have to possess any particular computer expertise at the outset.

### **Supports for Learning**

Most of the provisions of the Seed Teacher contract are aimed at teacher learning. A stipend is provided with the expectation that the Seed Teachers will purchase a computer for home. District administrators and Seed Teachers themselves say that an important part of learning to be a skilled computer user is using the home computer for personal and professional work. The district provides computer workstations, networked to the Internet, for teachers in their classrooms, so the home computer is a supplement to this. Additionally, the specified expectations are aimed at learning: take two classes, go to the computer conference, attend four district Seed Teacher meetings, and use two release days to work in the school building on technology issues. The elementary Seed Teachers work with partners, so that they either come on to the job with an experienced partner who shows them the ropes, or they take a job together and support each others' learning as they go. The district Seed Teacher meetings include formal instruction, sharing of programs and expertise, and briefings on district technology issues.

### **Provisions of Program are Learning Enablers**

The provisions of the program are intended to provide support and opportunity for Seed Teacher learning. In the beginning of the program, the training opportunities were more prescribed, but the expectations have become more flexible as the years passed and computer expertise grew among district teachers. When the program began, teachers were

provided five release days to work on technology issues, and they met once a month with the other Seed Teachers in the district. As new schools opened and the number of Seed Teachers grew, the money stayed about the same so the provisions of the program were cut down and spread out.

### **Seed Teachers Learn by Doing**

District administrators and Seed Teacher founders describe the Seed Teacher role with expressions like "trial by fire" and "learning by doing." They assume that Seed Teachers will learn by addressing problems and issues as they occur. Most of the Seed Teachers refer to this aspect of the job when they describe what they do and how it is a benefit to them personally. All Seed Teachers report that they have learned a lot about working with computers. Even Sylvia, who has difficulties, reports learning an enormous amount. Sylvia, Cindy, and Barry say in several ways that they do not have a knack for this kind of thing and that it has been a big breakthrough for them to be computer users and especially problem-solvers. The three of them relate their skills to men in their lives who are or were computer experts. Each is proud to use computers but they do not think they will ever approach the skill levels of the men. The three express ideas about their learning and their skills in emotional and comparative language.

Ned and Jack were early computer users and original Seed Teachers. Both are comfortable with their skills. Ned is a designer and programmer, Jack does the same with the Commodores but not with newer computers. Jack is a more utilitarian user of software while Ned enjoys being out on the edges of new learning and new tools. Ned would not work with students without computers, but Jack would be relatively unaffected, as most of his daily minutes with students do not involve computer use. Ned, Jack, Eloise, and Grace have integrated the use of computers into their personal and professional lives. Cindy, Sylvia, and Barry are struggling to be comfortable computer users.

Seed Teachers report that being a Seed Teacher has effected their problem-solving skills positively. Barry declares she is now willing to try anything, to wade into problems and try to figure out what is wrong. She is more assertive with people on help lines and with people in help relationships. She is not afraid to appear dumb and she sticks with a problem until it gets solved. This characteristic is also mentioned by Eloise, Grace, and Sylvia. Grace says she is revitalized by solving computer problems.

The contract and traditions of the Seed program require Seed Teachers to take classes, go to meetings, go to the conference, and provide the Seed Teachers with money for a computer. Their colleagues in each school depend on Seed Teachers which motivates

them to learn. Seed Teachers take on a public role in their school, agreeing to focus on computer technologies for two years. All of these elements are learning enablers. The Seed Teachers all became Seeds to be better learners and they see this as the most important aspect of the program for themselves personally. Cindy who discusses the program exclusively in terms of her own learning, thinks the Seed Teacher program is perfect.

### **Constraints on Learning**

While the Seed Teachers are extremely motivated to learn, and commit themselves to the role in order to learn more, several factors constrain their learning. When the Seed Teacher program began, the district confidently offered a series of workshops on specific topics like troubleshooting, word processing, and creating and using databases. As the years passed and teacher skills became more varied, Seed Teachers pressed the administrators to make the learning requirements more flexible which they did. Seed Teachers agree to be learners, but what they will learn is not specified. The former prescribed courses have not been replaced by a competency checklist or any kind of check-up or guidance on skills acquisition.

### **Difficulty in Constructing a Course of Learning**

It is difficult for a Seed Teacher or other staff member to construct a deliberate course of learning for themselves. When district administrators and principals talk about training for Seed Teachers, it is spoken of as a particular course of training. It is not. Seed Teachers look for learning opportunities on their own. Course offerings in the district are erratic and change from year to year. Seed Teachers can choose among district classes or courses offered by local colleges. Because no one person is really in charge of the program, some Seed Teachers shape the role to suit themselves. The Seeds in this study took advantage of the flexible rules. The more experienced teachers and more experienced Seeds, particularly, feel at ease in tailor-making the program to suit their needs. For example, Jack asked for three exceptions to the written contract; he did not go to the conference because he did not want to pay for his own meals and lodging, he wanted to count the classes he had been taking for the past several years as his obligation for classes, and he refused to do any model teaching of classes, even though it was not formally required. He believes that the expectations are more like a menu than a prescription.

The Cascade Park Seed Teachers, and all of the principals speak of Seed Teachers "going through the program" and "completing the course". However, there is no course,

and no one really coordinates the learning. Joanie, the Technology Team Leader, issues the contracts, handles purchases, and tracks the activities of Seed Teachers, but she does not have the authority to tell Seeds what they can and cannot do. Principals assume that someone at the District Office is running the Seed Program and District Technology staff say that the principals are in charge in their own buildings. Confident, assertive teachers like Grace, Jack and Ned become Seed Teachers and shape the requirements to suit themselves.

Cindy, Barry, Sylvia, and Eloise took the contract and expectations more literally. They took classes, went to the conferences, and attended the meetings. Sylvia seemed more unsure about what she was supposed to know and do. While Grace responded to this situation by defining the role and doing it, Sylvia felt uncomfortable and inadequate. Because she was not exactly sure what was expected of her, Sylvia compared herself to her partner, Merry, who is very skilled. Sylvia said that her ideal learning environment is a formally-structured class, with defined expectations, supported by notebooks of material and follow-up with specific activities. It is likely that she did not perceive most of the features of the Seed program targeted at learning (learning by doing, learning with peers, conference and meetings, computer for home) to be real learning opportunities. Cindy also says she learns best from classes, but she found classes of interest to take and applied what she learned in the computer lab. Sylvia both expected more formalized learning opportunities for herself, and had different visions of what technology-supported learning looked like in the classroom.

### **Difficulty in Providing Group Inservice**

The four meetings for Seed Teachers illustrate some of the strengths and weaknesses of the learning opportunities. The meetings for Seed Teachers have varied considerably from meeting to meeting and year to year. After the TEK Initiative began, some Seed Teachers felt that the district took a new turn and left them behind. Former Seed Teachers report a change in attitude regarding relations between district office staff and Seed Teachers. In the beginning, the initial groups of Seed Teachers were lead decision-makers for the district on how to use computers in schools. They read research and passed it around and discussed and debated different ideas and approaches. When the district adopted the TEK Initiative, technology leadership informally shifted. In later years, Seed Teachers have been more the recipients of training or information briefings, although they are invited to suggest training topics.

In the year of this study, Betty Tucker, Director of Curriculum and Instruction, took over direct responsibility for the Seed Teachers. Nominally, they had been assigned to Wes Wright, the Director of Technology, but he had never assumed any responsibility or caretaking of the program. Betty hoped to fold the program into the arena of teaching and learning, and she made curriculum software the focus for the year. A software allocation was coming up in the local levy money and she wanted Seed Teachers to help each school make good decisions about what software they needed and how to best use it. To this end, a training session was arranged for elementary Seed Teachers on *Logowriter*, a program just adopted by the district Math Review Committee and for which a district site license had been purchased. Another meeting led the teachers through a preview of elementary word processing programs, and another featured demonstrations of computer curriculum projects from a nearby district and a demonstration by a Lego/Logo vendor. The Seed Teachers met for one meeting in a high school computer lab to learn a little about the presentation program, *Powerpoint*, and about using the Internet.

Although not connected, these education plans sound like a good set of learning experiences for the teachers, but looked at together and more closely, they illustrate some of the difficulties that occur when districts inservice teachers in groups. The inservice on *Logowriter* was taught by 6-year Seed Teacher, Ace Rockwood, in the lab at Cascade Park. With all of the teachers seated at computers, Ace distributed the manual he wrote and then directed teachers to do each of several discreet operations, followed by time for independent exploration. Most teachers were confused, and all of the people around me wondered why they should want to know this program and why the math committee had adopted it for all of them. There was never a follow-up to this brief introduction and it is likely that two years later, most diskettes and notebooks are sitting in schools untouched.

When the Seed Teachers came together to learn about using the Internet, there was high interest and some expertise developing in the group. With all of the Seed Teachers assembled and their substitutes in place, there was a glitch in the district server which closed the network down. When the problem was solved, it turned out that the software and capacity of each computer was just enough different to make each unique and quirky. This was before the advent of the World Wide Web, when use of the Internet was more difficult. The instructors tried to teach the whole group at once and were not very successful. The reactions of the Seed Teachers to these difficulties were very different. Jack, who had taken a summer class for district employees and knew something about what he was doing, responded with relief. He was happy to see that things go wrong even for the experts, so he did not have to feel so bad when he had technical problems. He felt

sorry for the instructors and empathized with them. Grace, on the other hand, was furious. She felt that the instructor should have come at 6:00 a.m. to make sure that every single computer was hooked to the network and working right. She was insulted that all of the Seeds should prepare for substitutes, drive to the far end of the district, and come to a lab which was not up and running. Grace has lots of patience with unavoidable problems, but is impatient with situations where an investment of time and energy would make the difference.

Sylvia responded to all of the confusion by being more lost and thinking that if even Todd and Jack cannot get it to work, why should she bother. Barry thought it was all wonderful and couldn't wait until it really worked in her school. These diverse reactions are typical of the reception Seed Teachers collectively gave most of the features of the program. What was comforting to one was frustrating to another. Some group reflection or guided discussion about implications for classrooms might have enabled the teachers to understand their diverse reactions and to tie their learning experience to that of their students.

### **Lack of Clarity About Learning Role**

Some of the Seed Teachers refer to themselves as learning in front of everybody, but although their helping is visible, their learning is not necessarily so. They become Seed Teachers because they want to learn, and they say they learn because of the work they do. However, the vision of Seed Teachers as learners is not well-developed in all schools. Jack points out that when he was first a Seed Teacher, he understood the vision to be about learning, and then helping in your building during your term and after. He thinks that the philosophy is not well understood by current Seed Teachers. Even though Sylvia says that she used to think of Seed Teachers as experts, and now she thinks of them as learners, she does not seem to really believe her own explanation. At Cascade Park and Vintage, it is part of the peer expectation that Seed Teachers will be learners and fixers. At Lakeland, the talk is mostly of need for fixers, with little encouragement to learners. A recognition and articulation of the learning function of the Seed Teacher role in each school building might make Seed Teachers more confident that they are doing what they are supposed to be doing, when they struggle to learn new skills. It would possibly enable them to more deliberately model learning and problem-solving.

### **Downside of Flexibility**

The flexibility of learning options has positive and negative sides. District administrators assume that Seeds will have computers at work and at home. They used to purchase computers for Seed Teachers and train them on set-up and use when they arrived. This was an early summer activity to allow Seeds the summer to learn and be comfortable with their computers before the school year and their job began. When the money available for each Seed was reduced, computers increased in price, and Seeds asked to buy peripherals like printers and scanners, the district began awarding stipends instead of computers. The expectation was still that all Seeds would have computers at home and at school, but the expectation is not in writing. It is possible that a teacher will take the money and not buy a computer for home. For example, at the time she became a Seed Teacher, Sylvia could not decide what computer to buy and decided to wait until the price dropped on particular models with CD-ROM capability. Once the momentum of all the Seed Teachers buying computers had passed, she never did make the effort to buy one. She regularly took home her old Apple IIGS portable computer because she had a monitor at home, but found it cumbersome to take her bigger Macintosh home. Her professional and curriculum work were mostly done on her Macintosh. The circumstances of Sylvia's life were such that she would have used a home computer a lot, but she did not have one available. A requirement to have a computer for use at home would have been a positive push for Sylvia. One of her personal goals was to examine and evaluate software which she might have done at home.

The district administrators and many Seed Teachers believed the annual computer conference to be an important learning opportunity for Seed Teachers. They assumed that going to the conference would link Seed Teachers to big issues, national experts, new products, and teachers who could demonstrate new ideas for the classroom. However, Seed Teachers could opt out of the opportunity and since the district provided only conference fees and not food and lodging, the technology team leader did not think they could require teachers to go at their own expense. Some buildings filled in the difference and some did not.

Seed Teachers did most of their learning informally as problems arose. Many felt like they needed more direct connections to people with answers or resources for problem-solving. District officials expected Seed Teachers to buy a home computer, attend courses, learn from the computer conference, make time for learning, and establish help routines in their buildings. These expectations were not absolute and some were not supported with adequate resources. The district expected that Seed Teachers would take advantage of all of

the opportunities and that the program features would work together to support and enrich the learning and helping of each Seed Teacher. However, because of the flexible administering of the program, Seed Teachers individualized their personal opportunities, sometimes to the disadvantage of their learning, as with Sylvia and her non-purchase of a computer.

### **Missed Opportunities**

A researcher interviewing teachers and reading surveys hears and reads separate conversations which might profitably be combined. Two issues arose which represent missed opportunities for communication, one concerning the difference in perception of the Seed Teacher program by educators at different levels of the school system, and the other based on the visible appreciation of reflective activity by teachers interviewed and surveyed.

### **Support for Learning**

Listening to Seed Teachers describe their work is a contrast to the developmental and supportive language of administrators. There is a gap in communication and understanding about the role of Seed Teacher. The administrators are concerned about the learning of the Seed Teachers, and understand that the learning is experiential. All central office and building administrators, except Susan, described the job as a problem-solving learning period for teachers who committed themselves to it. Seed Teachers talked about learning from what they did, but did not internalize this notion of themselves as learners first, and helpers to peers second. If there were more public talk about the role of Seed Teachers, perhaps Seed Teachers would be more patient with the pace of their own learning and more deliberate in modeling their learning and problem-solving strategies.

### **Critical Reflection**

Another missed opportunity is the chance for Seed Teachers to meet with Seed Teachers online or in person and talk about learning and teaching. The experience of being a Seed Teacher throws most teachers off-balance and they are ready and eager for conversation and critical reflection. The teachers in the case studies were glad to talk about their ideas and attitudes about being Seed Teachers, and they came to many new as a result of thinking through issues related to the role. Most had not thought systematically about how and what they were learning about computers, helping, or teaching. They liked

puzzling through complicated issues related to bringing technologies into schools and how to do it well. The Seed Teachers responding to the survey wrote lengthy answers and suggestions. This thinking and reflective process could be built into the Seed Teacher experience, but it is not.

### **Supports and Constraints for Helping**

The job of Seed Teacher has always included troubleshooting problems in the buildings. It is assumed by the Seed Teachers and the designers of the program that this troubleshooting will be a learning experience for the Seeds. It is not expected that they will know how to solve all or most of the problems they encounter. It is hoped that they will be motivated by a desire to learn and a desire to help, so that they will puzzle through a problem or find someone who can fix it. The obligation to help and the commitment to the task by Seed Teachers is the source of problems and pleasure.

### **Supports for Helping**

The expectation that Seed Teachers will help others is the visible part of the program and they push themselves because they are helping. The public designated role of being a helper makes the Seed Teachers try things they would not try otherwise. In their logs, survey, and interviews, Seeds say that they make printers work, install programs, rescue stranded computer users, calmly work through a problem with somebody, and get another helper when they cannot solve a problem. They talk to people they do not know, they persevere with problems they would give up on, and they call up new Seed colleagues to brainstorm solutions.

#### **"Forced to Learn" by Expectation to Help**

Founding Seed Teacher, Ellen Harrington says the program was based on the philosophy of "each one, teach one." Grace says, "you learn and you share." Seed Teachers help their colleagues with hardware and software problems and they help buy technology for their buildings. They lead or serve on technology committees in their buildings. When Seed Teachers describe why they became Seed Teachers they say it is because they want to learn. When they describe what they do, they list how they help. The helping relationship with their peers drives their learning. Because they need to help, they learn. This is the feature they call "forcing me to learn." It is important that this is a

responsibility they take on for themselves and that they define their own success. If they cannot get a handle on it, as Sylvia's difficulties illustrate, they give up.

When Seeds cannot help a person, they feel obligated to find help for the person. The Seed contract gives them two release days to work on technology issues in the schools. The dynamic at work is that busy people take on an extra responsibility. They feel that because they need to help someone, they will persevere and figure out a problem or learn a solution, where they might not push aside the time or make the effort if it were just for themselves. In the process of helping, they become more competent. Hopefully, they also reflect on how different people learn and teach.

### **Recognition and Thanks Motivating**

In answering the question, "What elements of the Seed Teacher program are most important to you?" the leading answer was "the opportunity to help and share." The Seeds share Grace's sentiments when she says she likes to help and she likes for people to say thanks to her and be appreciative of her help. The Seed Teachers feel that the work they do is important because using computers in schools is important.

### **Role Brings Expanded Horizons**

Technology Specialist Todd Everett believes the Seed program opens horizons for the Seed Teachers. The role enables Seed Teachers to expand their focus out of the classroom in at least five ways; they take on new roles in their buildings, they enter the world of technology, they provide inservice to peers, they make decisions for the district, and they connect to others throughout their schools, the district, the state and beyond.

#### New Role With Colleagues

As Seed Teachers work, they are part of school technology committees charged with making technology decisions and purchases. Many Seed Teachers learn for the first time about the politics of their building, about working with parents and teachers on committees, about the budget process in their schools, and about the slippery task of trying to decide what is best to buy when the market changes so fast. This expanded role in the school building is an eye-opener for most Seed Teachers.

#### New World of Technology

Seed Teachers also plunge themselves into learning about and with computer technologies when they take on the role. Many of them read computer magazines for the

first time and start paying attention to technology news. Several teachers mention how great it feels to be "in the know" or on "the cutting edge." They like hearing about new issues and seeing new technologies.

Going to the computer conference was mentioned by several Seed Teachers as being very important to their development. They said it connected them to people out of the district and expanded their horizons of what is possible. The Vintage principal said that in most years the Seed Teachers come back from the conference really "jazzed and excited". For most Seed Teachers, the conference is their connection with a new universe of possibilities.

#### New Experience as Inservice Provider

As Seed Teachers come out of their classrooms, it is a big step to offer inservice classes to their colleagues. Teachers who are perfectly comfortable in front of classes of children and groups of parents, may freeze up in front of their colleagues. Rick, the principal at Vintage, describes this experience as a scary and developmental one for Seed Teachers. Eloise offered the most systematic set of courses among the participants in the study. Her work is still cited by all of the people in the school as being really important, and she believes it to be so. She set up a little lab with loaned teacher computers for three months and offered continuous after-school classes. Cindy taught a couple of them and Eloise taught the rest. Eloise and Sylvia entertain the idea of consulting as an additional or alternative career path, and it was important to them to practice working with their peers in a teaching role. Even the Seeds who work mostly one-to-one with other staff members appreciate the chance to try this different way of relating to peers.

Jack offers a series of what he calls "mini-workshops" to his colleagues. He collects a few computers together and teaches the participants some specific skill, like making a banner with *Creative Writer* or making a database. He demonstrates things he has done at staff meetings, if he is pressured to do so. He is nervous about staff meeting presentations, but seems matter-of-fact about the inservice sessions. Grace continually helps people one-on-one and prides herself on showing them one or two extra things each time that they might like to learn. Former and current Seed Teachers offer most of the courses taught in the district.

#### New Role as District and Building Decision-maker

Curriculum Director, Betty Tucker, gave the Seed Teachers thinking tasks related to the future of the program and developing district technology benchmarks. Federal dollars

form the bulk of the program money and are threatened every year. All of the administrators have tried to have the Seed Teachers collectively think through what the district should do if the money dries up. They get different answers from the Seeds and do not know what to do next. They breathe a sigh of relief each year that the federal program is refunded. Over the years of the program, Seed Teachers were sometimes the vehicle through which district decisions were delivered to schools. At other times, they were an information surfacing or problem-solving body. The emphasis has depended on who was in charge.

#### New Connections to Large Professional Community

All Seed teachers mentioned the pleasure of meeting with and working with other Seed Teachers and technology staff around the district. The Seed Teachers who linked themselves with a network of people perceived the role more positively. Eloise formed a personal list of which Seed Teachers to call for help on specific kinds of problems. Cindy said she asked Joanie, the Technology Team Leader, for help over and over, and was pleased to be linked in a work relationship. Barry liked developing a joking relationship with the repair technician. Grace corresponded by phone and e-mail with people all over the district.

Seed Teachers are a variety of people. Some have been in the district for a long time and have served on district committees, been in many buildings or had mobile jobs. These Seeds see the district differently from teachers who are very building focused. Ned has functioned in leadership positions in the district and does not perceive the "District" to be a monolith. When he and Grace (who has been a district administrator) describe the district, they do it in reference to individuals. Eloise, who is politically savvy in other ways, thinks there is a grand plan and someone in charge of technology. So do Cindy, Barry, Sylvia, and Jack. They talk about the "District" plan and the "District" wants us to do this or that.

All of the Seeds appreciated working with people out of their buildings and spoke in varying degrees of respect about being familiar with the technology staff. For some Seeds, this is their first experience in working with people outside of their buildings. All of them reported feeling extremely supported by Joanie Land, the Tech Team Leader. Curriculum Director Betty Tucker describes her "mothering" the Seeds and she definitely played a nurturing and connecting role with many Seed Teachers. To the extent that Seed Teachers stayed in close contact with Joanie, they felt supported, but they had mixed relationships with the rest of the people, mostly related to not understanding what

somebody was saying or not being able to get help when they needed it. Several Seeds reported feeling disrespected by the Technology Director and having a feeling that he did not understand the realities of classrooms. Seed Teachers collectively were eager to work with other Seed Teachers across the district. They liked hearing what was happening in other buildings and understanding how each other worked.

So, Seed Teachers emerge from their classrooms and take on new issues, including a focus on technology, leadership in their buildings, inservice responsibilities, and connections to people across the district.

### **Working with Partner a Benefit**

It is an important feature of the Seed Teacher program that there are two Seed Teacher partners at all times. When they go back to school buildings after training or get stuck on problems, teachers are not isolated and all of the expertise does not reside in one person. Together, partners can help each other continue learning and be supportive for each other. The Seed Teachers and their partners act as supporters for each other, and especially at Cascade Park and Vintage, former Seed Teachers stay involved with technology and help out when possible. Most Seed Teachers cannot imagine doing the job without a partner and say they would not have attempted the job without one.

### **School Role Affects Partner's Ability to Help**

Several schools have selected partners in which one is a classroom teacher and one is a specialist of some sort. For helping colleagues and revitalizing specialist teachers, this seems to work well, because the specialists often have more flexible use of their time than do the classroom teachers. In some cases, they do not need to invest the same amount of time in daily preparation and grading of papers so they can troubleshoot problems more directly than a teacher who is tied to classroom duties.

Some Seed Teachers have been physical education specialists. This seems to be a good match, especially for experienced teachers like Grace who have long since mastered the routines of curriculum and classroom management. The library media specialist role also lends itself well to the addition of Seed Teacher duties. The librarian duties and Seed Teacher mission are a good fit. In many schools, library media specialists are expected to do many of the duties performed by Seed Teachers in Vista Schools and the role seems natural to elementary school peers. Elementary specialists often work in isolation from the other adults in their buildings, as they are usually the only one in the building with their job assignment and specialty. The addition of a new role revitalizes their learning and connects

them directly with their peers. The specialist/classroom teacher pairing can let one partner focus on trouble-shooting and one focus on curriculum.

### Effects of Partner Rotation Schedule

Another issue with partners is whether to stagger the rotation or have new Seeds on the same cycle. Eloise, Jack, Barry, Cindy and Ned all advocate the staggered rotation, because they believe it allows the new Seed more learning time and maintains continuity from year to year. The veteran Seed Teacher helps the new one with issues in the school and tactics for dealing with various people and problems.

This model is deliberately in place at Vintage. Rick picked Sylvia to be the novice learner with Merry being expert. It does not seem to have worked in Sylvia's case. She compares her learning and her knowledge to Merry's and thinks she is inadequate. Sylvia mentioned several times that it would have been easier for her to have a partner at her own level. To Curriculum Director, Betty Tucker, the essence of the Seed Teacher program is that people rise to the occasion when they are the only ones who can help in a situation. Perhaps the fact that Merry and others in the building could help most people better than Sylvia, let her off the hook for her own learning. The gap between their skills and hers seemed vast. Maybe if she had taken on the job with someone with skills at about her level, she could have succeeded. This one small example illustrates the difficulty faced by districts and schools in making hard and fast rules for implementing a program.

### **Constraints on Helping**

The Seed Teacher program is structured in such a way that Seeds are expected to help. It is a written expectation. When they take the job on, they know they will be helping their colleagues. In this way, the very nature of the program pushes them to be helpers, but the job proves overwhelming to some.

### **Too Little Time**

Seed Teachers all wish they could help more teachers in their school and that the program would support this by giving them more time or more helpers, for instance, better access to TEK students or assigned classified staff time. Longtime teachers, with an awareness of finite budgets, proposed that they be given anything from one period a day to one day a month to work on computers in their buildings. All had specific ideas about what they would do with more time.

### **Too Much Troubleshooting**

According to questionnaire and interview responses, a large factor inhibiting increased activity and skill in teaching students with computers is the demand on Seed Teachers' time for continuous troubleshooting. All spare minutes that a teacher might spend learning a new program or piece of equipment or organizing a learning station, is spent figuring out why Joe Smith's printer is not working or why the e-mail is down again. The Seed Teachers work with a complex system of technology in the schools, a mixed array of computers, computer operating systems, variety of kinds and versions of software, and various configurations of hard drive and memory on computers. Add to this that the computers are supposed to all be connected in an operational network, and the potential for problems is great. All Seed Teachers report being overwhelmed with troubleshooting work and unable to keep up. They want to be relieved of exclusive responsibility for this duty so they can concentrate on learning and teaching.

Between 1991 and the present, the district provided every teacher with a computer workstation, with increasing numbers of computers for students and, with desktop connection to the World Wide Web. Money has been stretched and skimmed to get hardware and software installed little by little. Seed Teachers and TEK high school students have been the laborers in building this system and the recipients of district investment in these tools. On the other hand, the level of the load is now becoming so big and complex that the Seed Teachers feel they are crumbling. Seed Teachers have worked hundreds of hours, and have been able to use good tools with excellent connectivity because of the technology base the district provides. The district hired longtime Vista technology teacher, Todd Everett half-time to support teacher learning. He spends most of his time in school buildings fixing the hardware, because he cannot help people teach when the tools do not work. His labor is a drop in the bucket of troubleshooting needs and his facilitating work with teacher technology projects is inhibited. The Seed Teachers are not supported with mentors, specific classes in how to teach, special materials, or networks with each other. Support by Todd or other technology staff just scratches the surface of what they need.

Many of the problems teachers need help with are technical in nature and could be handled by a student or a classified employee. Several Seed Teachers advocate hiring a classified person in each building who could figure out why printers do not print and make one computer talk to another. Before teachers can comfortably use computers to teach, or even let students use them, they need to know that they can get help on the technical problems. However, when Seed Teachers spend all of their time helping with technical

problems, this uses up the discretionary time they have for personal learning, experimentation, and trying new things in their classrooms. The district expects that the Seed Teacher program will be enough by itself to support teachers in the buildings. Even in the elementaries, which have two Seed Teachers and an accumulating expertise, the problems with technology outstrip the abilities of the Seed Teachers to cope.

### **Supports and Constraints for Teaching**

Lead teachers function as models and learners. Seed Teachers are seen as model learners and expected to be model teachers. Technology Team Leader, Joanie Land says they lead by example, "If I can do it, you can do it." At Cascade Park, non-technical people like Cindy, Barry, and Shelley, by their example, inspired other teachers to try computer activities with their classes. Because they were known by their peers to be reluctant, hesitant computer users, when they became more capable and more visible, other teachers were convinced they too could learn and teach with computers.

District officials hope that Seed Teachers will transform their classroom practice, but a look at the classrooms of most Seed Teachers does not reveal transformed learning environments. It is difficult to imagine what reasoning would predict that the addition of a couple of computers to a classroom, and added learning and helping responsibilities for the teacher, would produce altered classrooms. The introduction of computers into schools has been accompanied by an almost magical belief that a computer or two will transform traditional practice into more powerful progressive practice. Almost nothing in the expectations and provisions for Seed Teachers creates a structure by which a reasonable person could predict transformed practice. Some of the provisions of the program, the expectations of their peers, and their personal learning plans do nudge and encourage teachers to teach differently.

### **Supports for Teaching**

The contract signed by Seed Teachers does not require specific teaching activities or changes in the classroom, but the traditions of the Seed Teacher program and the district and building expectations are that Seed Teachers will be leaders in using computers for teaching and learning. The contract suggests that Seed Teachers conduct model lessons, and in various schools, it is Seed Teachers and former Seed Teachers who most use the computer lab or model the use of some new software package.

### **Suggestion to Conduct Model Lessons**

One of the expectations of Seed Teachers used to be that they teach model lessons with students. In the early days of the program, this meant that a Seed Teacher offered a lesson to a class while the teacher watched and learned how to teach with computers. This was an unpopular expectation among some Seed Teachers, because it made them nervous. Jack reported getting so upset about it that his doctor advised him to stop being a Seed Teacher when he developed high blood pressure. When schools had trouble getting teachers to volunteer to be Seed Teachers, and as the district moved to building-based decision making, the model lesson requirement was changed to one of several suggested activities Seeds might conduct. None of the case study Seed Teachers reported teaching model lessons, but eleven other survey respondents wrote that they do. Most said that they conduct group or individual tutorial inservice sessions for their colleagues. Some teach computer classes for students, but the thrust is not demonstration teaching for colleagues.

### **Pressure to Increase Visible Use of Computers with Students**

There is much rhetoric among district staff about Seed Teachers being lead teachers in technology use. Because they are designated as computer-focused teachers, most Seed Teachers attempt to visibly increase their computer activities with students. When he became a Seed Teacher and a participant in this study, Jack dusted off old Commodore computers from his back conference room and from around the district and set up a row of them in the back of his classroom. He immediately drew notice from parents and some resentment from teachers. Other teachers did not want the old computers, but they feared that the attention Jack was getting would cause parents to expect more computer activity in their classrooms. Jack's second graders now regularly use the Commodores and other computers in the room. Because he is a Seed Teacher, Jack is trying different computer-based presentations with his second graders, and he teaches them to use various programs on the assortment of computers in his room. The two Seed Teachers before him reported increased activity when they were Seeds because they felt like they should be modeling computer use with their students.

Barry and Cindy teach their fifth grade students daily in the computer lab and the computers in their rooms are in constant use. Both say that they are comfortable and active in letting students do more because of what they learned as Seed Teachers. Eloise has such a firm identity in her school now as a computer user that she is the acknowledged leader when students and teachers have hardware-related problems. She organizes staff and

student lessons in the library on specific computer tools, like using the online catalog, and researching CD-ROM databases, and using the laser discs with the computers.

Grace works almost exclusively with teachers, because she has no contact with students and computers in her role as a physical education specialist. Sylvia reports that being a Seed Teacher does not affect her teaching except to add to the stress. She uses computers a lot in teaching her first graders and does not attribute any of it to being a Seed Teacher.

### **Inspiration from Conferences and Classes**

Some Seed Teachers use the learning opportunities they enjoy from the conferences, classes, and meetings to set up learning activities for students. Often at Seed Teacher meetings, there is a designated time for sharing projects and activities happening in each school, and Seed Teachers to talk about what they have facilitated with students.

### **Constraints on Teaching**

Seed Teachers are provided with opportunities to learn and an expectation to help. They try to use computers visibly in their classrooms, but are not supported with any pedagogical guidance. In all aspects of their work, Seeds are expected to learn mostly by experience and through their own initiative.

### **Difficulty in Helping Each Other Teach**

It is a difficult expectation that teachers help each other teach. There is no built-in mechanism in most schools to enable this to happen. Teachers do not often see each other teach, which is an outcome of the cellular structure of schools and the developed norms of privacy. It is difficult physically and socially for teachers to share their teaching activities and skills. Teachers are with their own students for most of the hours they are in school and it is difficult for teachers to "toot their own horns." Yet this norm of privacy and hands-off personal artistry is counter-productive if teachers are to learn new ways of learning and teaching.

### **No Formal Expectation to Teach Differently**

Seed Teachers are expected to help their colleagues learn. When teachers become Seeds, they are designated as computer helpers and computer leaders. They take responsibility on building technology committees and they make decisions about

technology in the building. None of this is directly related to how they work with their students. In recent years, there is no written, clearly stated expectation that Seed Teachers will be leaders in teaching with technology. The other expectations are clearly spelled out...go to the conference, go to meetings, take release time in the building to do what the building needs. When the written requirement about model teaching was dropped a few years ago, nothing similar took its place. There is an assumption among many colleagues and technology administrators that Seed Teachers will be leaders with their own teaching, but there is no structured requirement for demonstration of this expectation.

It is hoped by administrators that learning to work with computers and helping peers will include changes in teaching and learning for students. However, there is no reflective component of the program, and no deliberate effort to help Seed Teachers think about broader issues. Most of the focus is on learning about hardware and software tools, rather than thinking about teaching and learning.

### **Few Images of Teaching with Technology**

Most Seed Teachers expect themselves to be leaders with technology and so they take on projects they might not have attempted because they think they should. Since there is no stated standard on what this entails, they decide for themselves. Because of the differential skills in the three buildings under study, it is easier to be a leader at Lakeland or Cascade Park than it is at Vintage.

### **Limited Visible Impact in Classrooms**

The end goal of a professional development program is enhanced learning opportunities for students. There is a lot of talk in Vista School District about Seed Teachers being the pioneers in teaching with computers and being teacher leaders of best practice with computer learning. Ned's classroom models effective use of computer tools by students in the classroom and library and at other sites. Current Seed Teacher Merry's music classes and former Seed Teacher Serena's library are exemplars of positive use of computer technologies for enhanced student learning. While much of the best teaching with computers in the district is done by current and former Seed Teachers, it is difficult to see direct impacts in the classrooms of all Seed Teachers. Jack's second grade classroom would function about the same with or without computer technologies, as would Barry and Cindy's.

The talk about transformed classrooms is not reflected in the written contract for Seeds, and Seed Teachers learn according to their own beliefs and capacity. Seed Teachers themselves do not say they will dramatically transform their classrooms. That is language used on their behalf by people outside the classroom. Teachers mostly say they will learn a lot by being Seed Teachers and they will gradually add experiences to their classroom expectations for students. The Seed Teacher program addresses teaching indirectly and without guidance, and results in the classroom are indirect and varied.

### **Differences Emerge in Program Over Time and Across Schools**

As the Seed Teacher program has grown and evolved, it has developed somewhat differently in each school. Multiple visions of the role of Seed Teacher exist and affect the work and learning of Seed Teachers. The lack of administrative direction has affected the shape and longevity of the program, and each school has put its stamp on the program. Administrators influence the impact of Seed Teachers in each school. The job of each Seed Teacher is affected by the role and level of involvement of former Seed Teachers, and the balance of requirements and incentives present in each school.

### **Multiple Visions of the Seed Teacher Role**

Several role definitions have existed simultaneously for Seed Teachers. When the Seed Teacher program started, there were few computers or computer users. As the numbers of both have grown, the needs have multiplied in the buildings. A reading of early reports and interviews with current leaders reveal several interpretations of the role of Seed Teacher which continue to be held today.

#### **(1) Technology Expert**

One vision is that of a technology expert who will help fellow teachers and model ways to work with students. The learning for colleagues comes from observing and from tutoring. The person functions as a conventional specialist teacher, but the job is compensated as an added responsibility. In this model, a person would logically hold on to the job for many years, acquiring more and more expertise.

#### **(2) One of a Cadre of Trainers**

A second related idea is the "train the trainers" idea. Cadres of teachers are trained and they conduct training in their buildings. They are also the focus for continued

training updates. An assumption here is that there is a course of training which the trainers receive and then share.

### (3) Designated Learner/Helper

The third idea is the "designated learners" model in which teachers agree to trade service for learning opportunities. They take formal training, but it is understood that the gist of the learning is "on the job." In this model, teachers would rotate in and out of the role and most teachers would eventually be Seed Teachers. Learning is experienced by the Seed Teacher and by facilitated experiences for the others. A building would expect to see a growing expertise in the faculty.

Interviews revealed that all three visions of a Seed Teacher are held by teachers and administrators. Depending on which vision is the predominant one, decisions regarding tenure and compensation of Seed Teachers differ from person to person or school to school. In the beginning, Superintendent Brand wanted teachers to take on leadership roles and teach their fellows. The Curriculum Director says that avid computer user/teachers were springing up in the buildings and that they needed to be supported and encouraged. Seed Teacher Ned, Assistant Superintendent Brad, and Technology Specialist Todd say the point of the Seed Teacher model is to put people in situations where they have to take a risk.

The Seed Teacher program has accommodated all of these visions in its history. It did provide support and materials for early enthusiastic computer users, it does encourage risk-taking, and the Seeds are expected to handle technology issues in the buildings and teach their peers. They are expected to be leaders among their peers in working with computers for instructional uses. The ambiguity about the role has produced positive and negative results. Most Seed Teachers enjoy a reputation as "experts" with technology, and because the reputation comes with the role, most of them rise to the expectation. Not many teachers would take on the role just to be "technicians." They like the aura of leadership and expertise that comes with the designation of Seed Teacher. The ambiguity of the role has allowed and encouraged a diverse group of people to become Seed Teachers. The diversity of the group has produced several models of how to be a Seed Teacher and has encouraged administrators who would change the program to leave it alone.

The multiple visions for the role can cause difficulty for Seed Teachers who do not think they are fulfilling the multiple expectations, or for colleagues who think they are not getting what they need. It is hard to know by listening to Jack and Grace alone, whether or not the previous Seed Teachers followed the provisions of their contract, but the two of them did not feel assisted. It is also difficult for district and building administrators to know

what to expect and require of Seeds. The issue of whether to turn the role over every two years is directly affected by whether one thinks of the role as a helpful expert or a designated learner. There would be no reason to turn the job over if the emphasis was on expert help. As needs grow, the Seed Teacher program is getting more scrutiny.

In all three schools under study, there are mixed feelings about the role of Seed Teachers. Teachers in classrooms need help, they like getting help from people in their own buildings, and they want it when they need it. This desire can be in conflict with the idea of rotating people through the position. If beginners are starting two-year terms, there could be a gap in time when they do not have the answers needed by their colleagues. Seed Teachers know this. Some work harder to learn and to please. Some probably never attempt it, and in some buildings there are Seed Teachers serving multiple terms. It seems to take a strong conception and continuing articulation of the program as a learning position (like at Cascade Park) to support the reception of new teachers into the program.

In the schools where Seed Teachers serve term after term, a person needs to feel brave and assertive to say he or she wants to be the Seed Teacher. If the rule of thumb is, become a Seed and then start learning and helping, novices can take the job. If teachers expect an expert helper, a novice will not volunteer. At Vintage, the principal, members of the Technology Committee, and the Seed Partner all supported novice Sylvia in taking the job. They described this feature when they described how the roles and jobs were split.

At Lakeland, Grace was very ambivalent about giving up her Seed Teacher position. She knew she was doing a good job, and did not want the school to go backward by having someone in the role who did not know as much. At Vintage, Ned suggested that the learning role be the Seed Teacher role and the service role be funded on extended contracts. Grace would be happy to accept if her principal offered her a stipend for troubleshooting in the building. A little recognition and good structure would gain the building of Lakeland many hours of positive labor from Grace.

### **Program Different From Building to Building**

The Assistant Superintendent through much of the program says that the Seed Teacher program needs to be building-based and never turn into a cookie-cutter, one-size-fits-all program. He believes that if it stays flexible, the district will have several models of what works. He thinks we do not really know what helps everybody, so if buildings are allowed to build their own systems, they will work better. The program has evolved differently in the various schools.

By supporting learning opportunities and giving the Seed Teachers resources, the district personnel expect that Seed Teachers will take the initiative to learn what they need to and help out in ways each building designates. In buildings like Cascade Park with its strong perception of the Seed Teacher as a learner, Seeds feel comfortable taking on problems and working through them. At Lakeland, Jack and Grace stand in contrast to the two teachers before them in their dynamo approach to the job. Much of the work that gets done obviously depends on the people themselves, but the building context can support learning or not. Lakeland has laissez-faire leadership with technology issues and no built-up storehouse of expertise or helping. Jack and Grace help with ferocity because of their own standards, their shared love of challenge, and the time benefit of her being a specialist and him being a classroom teacher. The specialist Seeds, like Eloise the librarian, Grace the physical education teacher, and Merry, the music teacher, have more moments in their days without thirty children in their care. They can devote more time to troubleshooting on the spot and they do.

#### **Cascade Park: Supportive To Learners**

Each of the schools in this study provided a unique context in which to be a Seed Teacher. By far, Cascade Park, was the most supportive of the Seed Teacher as learner. The principal, the former Seeds and the current ones all describe the Seed Teacher as a person who gets to learn in exchange for helping out. They said with one voice that a Seed Teacher did not have to start out knowledgeable, he or she just needed to set aside the time and make the effort to learn. They all said they hoped that everybody would be a Seed Teacher, and that if everybody was a Seed Teacher, then the whole school would be "on board." At Cascade Park, one third of the teachers consider themselves beginners and two thirds consider themselves to be intermediate-skilled users of computers. Nine teachers reported wanting to be a Seed Teacher. Shelley, one of the current Seed Teachers, said that there is such a built-up base of former Seed Teachers in the school, that teachers are willing to volunteer and not afraid to try it. There are eight current and former Seed Teachers at Cascade Park. The former principal, Pauline, learned to be a computer user by starting in classes offered by Eloise, and moving on to other classes and practice. She put out her own daily bulletin and celebrated her growing skill with her computer. The current principal, Tom, talks about building a culture of learning and cultivating the conversation about learning with technology. He is personally supportive to the Seed Teachers, and provides them with extra release time if they need it, and carefully parsed out responsibilities.

Cascade Park has a computer lab, consisting of Macintosh LC computers that were becoming obsolete almost as soon as they were purchased. They are one of the only elementary schools which has a computer lab and they say they are happy with the arrangement. While teachers in other buildings are figuring out what to do with one or two computers in their rooms, the Cascade Park teachers have been figuring out how to teach in a computer lab situation. Although more computers are coming to their classrooms, they have been able to keep the student work on computers mostly in the lab and out of the core areas of their teaching.

### **Lakeland: Missing Seed Teachers Equals Missing Traditions**

Lakeland is a contrast to Cascade Park. There are only four current and former Seeds in the building now. Former Seed Teachers have retired or moved. Jack and Grace are and have been vocal critics of the previous Seed Teachers, Rory and Morgan, and Grace is outspoken in her assertion that they just took the job for the money and did not help out enough. When I interviewed Rory and Morgan in 1992, they said they were overwhelmed with the responsibilities and could not get it all done with their teaching loads. One of them left teaching, and one is still at Lakeland. The fourth Seed Teacher in the building is June Underwood who looks for ways to be involved with technology, but feels left out.

The principal, Susan, talks about the role of Seed Teacher as a technology support person for the school. She said she is pleased with the work of Jack and Grace. They both feel that she counts on them. While Tom at Cascade Park actively lobbies with the administration for more money to buy software and more attention to getting problems fixed, it does not appear that Susan sets technology use as any sort of priority. At Lakeland, half of the teachers say they are beginners and most of the others consider themselves to be intermediate users of technology, so they perceive their skills to be collectively low. The building and portables are spread out on several levels, which makes mobile computers difficult. There are one or two computers in each classroom for student use, in addition to teacher workstations. Lakeland has a group of parents who want to help the school use computers better. They raised money for each classroom teacher and have offered to personally teach one-on-one lessons for any teacher who asks. The generous offer seems to have had little effect. The computer committee, consisting mostly of parents meets at night and Jack and Grace are not willing to do it then, so a connection is missed.

Jack and Grace are the most powerful, organized Seed Teacher team in the district. They have inventoried the equipment and software and keep a checklist listing everything

they do with every machine or individual. They are conscientious about troubleshooting, and purchasing, and inservicing their colleagues. Their building seems the least able to support their efforts and build on them. Jack was hesitant to become a Seed Teacher because he was one year ago, but he rationalized that he has much to learn. Grace does not want to give up her position to a novice. When their two year term expires, it will be interesting to see what happens next. Without a learning emphasis in the building, and in following a powerful team, the next Seed Teachers might have a rough road. Jack and Grace would continue their involvement if a role were defined for them.

### **Vintage: Online School Encourages and Uses Expertise of Teachers**

Vintage offers another unique context. It was designated as a "Next Century" school by the state education office, and won its grant by proposing to work on two areas, parent involvement and learning with technology. Vintage built a Macintosh local area network several years ago and has been fully online for daily functions of attendance, lunch count, messages, daily bulletin, grade reporting, and all kinds of communications. The building hosts several experts in various computer applications. Ned, Serena, Carin and Merry have superior skills and function in leadership roles in the building and district. All have been Seed Teachers and Ned and Carin co-chaired the Seed Teacher group for awhile. As a building, they assess their skills as 16% beginners, 73% intermediate, and 11% expert, so they perceive themselves to be far ahead of the teachers at the other two schools.

Rick, the principal, is supportive of the Seed Teacher role as a learning one. He says it has been different in each of his years in the building and he supports the program however it goes. He recruited volunteers, specifically a novice, and he encouraged Sylvia to continue in the job. He urged her to write a monthly column in the parent newsletter about technology, knowing that she prides herself on being a writer. During the grant time, a technology support person was hired to work half-time for a year. Since that time, Rick, paid several teachers stipends to be in charge of technology issues. All technology expertise is not expected to come from the Seed Teachers.

Technology integration is farther along at Vintage than at the other schools. All of the teachers routinely use computers in ways that are still not in place in other schools. Because of the insistence of the skilled users, the Technology Committee has a policy of setting aside 20% of its yearly allocations for high-end equipment. There has been a recognition that the teachers will learn at different rates and that they need people out front trying new things. Sylvia's difficulty in being a Seed Teacher is an anomaly at Vintage, as previous Seed Teachers found ways to contribute and feel successful.

### **Seed Teacher Program Responsive to Building Needs**

Each Seed Teacher who bargained his or her way into some special arrangement probably thought he or she was the only one doing so. Much of the ambiguity that comes from underfunding and lack of supervision actually worked to keep the Seed Teacher program going. The program was formed with a delineated structure and philosophy, but was then orphaned administratively, so it has operated without much oversight or deliberate tinkering. This has produced problems, but also has allowed the program to serve each building individually and it kept the original provisions of the Seed contract mostly intact. Inertia has allowed the program to continue, and when it is looked at periodically, the administrators cannot think of anything better to replace it.

Responding to building questionnaires, all seventy-seven of the staff colleagues in the three schools said that the Seed Teachers were helpful and that the program should continue. In schools where teachers, working on site committees, have grown accustomed to weighing priorities, a unanimous vote to use resources for this program is noteworthy. Colleagues say that it makes a big difference having helpers in each building. They see expertise building up in their schools. At Cascade Park and Vintage with seven and eight Seeds in the building, the numbers are starting to make a difference in the comfort level of staff. Several teachers at each school said that they want to be Seed Teachers, so they see the role as a possibility for themselves in the future.

### **Administrator Impacts Building Support of Seed Teachers**

Several implementation reports cite the importance of principal support to the long-term adoption and success of an effort. Principals set the climate for the building and control resources over time. In some technology studies, administrator support was not only related to positive attitude and material support, but actual technology use of the administrator. The three principals in the study illustrate some of the ways a principal can support or flatten an attempted implementation.

Vintage principal, Rick, was a committed learner and user of computer technology. He facilitated the writing of the Next Century grant focusing on technology integration, and followed the lead of his expert teacher-users, especially Ned and Carin who had helped found the Seed Teacher program. He took classes with his staff, asked Seed Teachers for help often, and produced his work on the computer. As soon as the first building network was operational, he put all school functions online, even though this was difficult technically. With the grant money, and then from building funds, he hired Vintage staff

members to troubleshoot specific areas, to design manuals for use of particular software or kinds of equipment, and he used computer technologies for his presentations in staff meetings. He tried to learn in public as well as in private, using a gentle and joking manner to coax people along. Teachers had to use the local network for attendance, lunch count, and all communication. Rick sat on the technology committee and helped find resources or encourage others to find resources necessary to complete projects. When the district network was down or something did not work for what he thought an unacceptable amount of time, Rick called the Superintendent to get things moving. Rick's example and leadership, plus his cultivation of teacher leaders, enabled Vintage to get farther along than the other schools in facilitating learning with technology for its students.

Tom, at Cascade Park, came into a building which felt abandoned by the previous principal and down and out because of its problematic and challenging student community. He immediately set about finding more resources for the school and supporting the teachers in a number of ways. Visibly increasing the amount and use of technology is one of his goals. He has a reputation for lighting fires under situations which could use a spark and the staff at Cascade Park report that the school is now a hopeful place to be. He believes in developing the teacher community as a learning culture and wants technology to be part of the tool box. He is a moderate user of technology but a vocal supporter. He uses humor and offers of help to push teachers along and support Seed Teachers. Tom, like Rick, supports a dynamic library media specialist and continually asserts that her role is an essential one for ushering students and teachers into the next century with new information technologies.

Susan, the principal at Lakeland, is a contrast to the other two principals. She is a moderate personal user of technology but it is not a priority for her. She depends on the Seed Teachers to give help to their peers, but all efforts seem to fall flat. Her school is the recipient of a generous offer by a group of parents to be personal technology trainers for teachers, but she has not turned the offer into an operational opportunity. Her library media specialist is just keeping her head above water with technology, but neither she or Susan act like they need to change the situation. Rick at Vintage makes positive use of former Seed Teachers by finding roles for them, and paying them to teach or write or fix things. Susan does not know how to leverage the efforts of her staff. Jack did not go to the computer conference one year because he did not want to pay for his own room and board, and yet he would have learned a lot from it and been willing to share what he learned. Susan could have funded his expenses, but she did not think of it. If Susan were to do something's like this with Grace especially, she would insure tremendous help to her

building. Susan wants helpers in her building, but is not committed to having learners. It will be difficult for expertise to build at Lakeland.

### **Involvement of Former Seed Teachers**

When a Seed Teacher finishes a two-year term, there is no plan for what happens next. At Vintage, all former Seed Teachers are engaged in paid and volunteer work related to computer technologies. They serve on district committees and building technology committees, write software manuals, tend the network, preview new software, teach inservice classes, and take on new projects with their students. The principal at Vintage compensates teachers for most of this work. In most other buildings, former Seed Teachers report feeling sad and "out-of-the-loop." While some are ready to give up the pressure of constant troubleshooting, all enjoyed the stimulation of district meetings and computer conferences. When they are not in charge of technology issues, many have trouble figuring out how to have a continuing role, so they slowly drop back from active involvement. It is a concern of district administrators and current and former Seeds to develop opportunities for former Seeds.

The metaphor employed to name the Seed Teacher program pictures Seeds being planted, nourished and growing. Then others are planted and grow, and others grow from runners and natural seeding until there is a whole growing garden. If the teachers are the plants, the metaphor only works if there is a mechanism in place to keep the original plants growing. In fact, when the Seed Teacher term is over, there is often no plan to keep the teachers involved or growing with technology. After an intensive immersion in learning, teaching and helping, new people take over and former Seed Teachers are finished. Tech Team Leader, Joanie, says that Seeds are so exhausted when they finish being Seed Teachers, that they are happy to hand over the reins to somebody else. Former Seed Teachers told me they felt "dumped." As with most things, Seed Teachers react in a variety of ways to the end of their terms. Some former Seeds continue to learn and increase their work with computers in their classrooms. Some figure out ways to help in their schools, even though they have no formal role, by serving on technology committees or advising others on software choices. Two former Seed Teachers have carved out special roles for themselves, one started a technology magnet program and the other made a role for herself as a teacher trainer.

Several former Seed Teachers said they missed the excitement and involvement, being in on new developments, and seeing new possibilities. They miss the meetings and

work with teachers across the district. Like Jack and Merry, some former Seed Teachers take on the role again, in the same or different schools. While they enjoy it personally, they know that others should have a chance. Grace and Jack gave a lot of thought to the problem of keeping former Seed Teachers involved. Jack hopes that they will be invited to participate in training, decision-making, or even Seed meetings.

### **Seed Teachers and Administrators Struggle to Find Balance of Requirements and Incentives**

When administrators and Seed Teachers think about the essential elements of the Seed Teacher program, they disagree. What is an incentive for one person is a disincentive for another and a neutral factor for a third. As the possibility of budget cuts threatens the existence of the program, groups puzzle through issues such as time, money, and expectations for specific amounts and kinds of learning, helping, and teaching.

While all of the Seed Teachers were grateful for the time they received to do their job, none thought it enough. It is unlikely that any allotted time will ever be perceived as enough, as time is not a concrete issue. Perception of time is the critical factor. A key reason the Seed Teacher program works to help each building, is that Seed Teachers trade some incentives for the investment of a great deal of time and energy. It could never be a compensated trade, if figured in concrete dollars and cents. The whole balance of the program rides on Seed Teachers investing many hours of their personal time into learning and helping. The question is how best to do this? While Seed Teachers mention this issue over and over, they also live in the real limited fiscal world of their schools. They say there should be full-time specialists or district specialists, but when they suggest realistic options, they would settle for much less. Grace says she needs 1/2 hour a day of release time to do her job. Barry says that one release day a month would work. These are not huge requests considering the work they hope to accomplish.

The most commonly perceived inhibiting factor of the program is the expectation that so much work should be done with so little time allotted for it. Overwhelmingly, all Seed Teachers said that the main drawback of the program was lack of time to do it properly. On an open-ended survey of Seed Teachers, 22 teachers wrote that lack of time was the main drawback of the job. The next drawback, listed by only 7 Seeds, was interruptions to teaching time. Time is the issue they all refer to constantly. It is the critical issue cited by all major studies of teachers and technology. When Seed Teachers take on the role of Seed Teacher, they take on a responsibility to help in their buildings. They

know that the job will require an investment of time. To a greater or lesser degree, the individual Seeds figure out how to contain the expectations so that they can meet them. Only Sylvia was unable to get a handle of this issue and she felt unsuccessful and quit being a Seed Teacher after only one year.

It would be a mistake to define Seed Teacher commitment only in terms of the material incentives offered. The incentives were important, both because of what they enabled teachers to do (computers and classes), and because they functioned as a recognition of the teacher as a professional person with professional working tools and access to continuing education. As Jack pointed out about being a Seed Teacher, "It's a great responsibility. And a greater honor than you're being paid for. It's incredible to me to think of all the things people feel you should be able to do. If they have a problem, they want it solved right now." The time committed by all of the Seeds was not compensated in any kind of direct way and all of the material incentives were their visible rewards for taking on extra duty. The material incentives enabled the Seed Teachers to feel taken seriously so that they volunteered their time and energy. The teachers wanted to help others, they wanted to improve the school, and they wanted to help students learn better. A puzzle in a role like Seed Teachers is figuring out the right balance of challenge and reward so that they will invest their personal and professional time and energy in a new task, knowing that what is a motivator for one person could be an inhibitor for the next.

### **Summary**

Betty Tucker, current supervisor of the Seed Teachers, and Ned Masters, both founders of the program, use a "sink or swim" metaphor to sum up their feelings about Seed Teachers, learning and risk-taking. Betty says, "The glory and frustration of Vista is that we throw people in deep water. But when you swim, it's wonderful." Ned reflects on benefits of being a Seed Teacher,

"I think the benefits that happen are that lot of them get thrown into a risk-taking situation. And they may not see that as a benefit. Long term it really is, because it's almost like taking the reluctant kid who wouldn't learn how to swim and you have to grab him up and hold him in your arms and jump into the water with him to get him wet. That is the most powerful benefit, which is why I also believe that we should always be rotating ... get a whole staff on within in a certain cycle."

Seed Teachers would disagree about whether they are floundering around alone in deep water or whether someone is guiding and holding them up.

The Seed Teachers say they want to learn and they want to help. They like being "in the know" with technology issues and they like the positive recognition they receive for being a "computer" person. To the extent that they feel positive about their learning and their contributions, Seed Teachers trade their labor for the material and intrinsic benefits. Because they are needed, they commit many unpaid hours to learn and to help. Novices and experts work as Seed Teachers. Successful Seed Teachers create help networks for themselves and configure the job expectations to match what they can achieve. All Seed Teachers want more time to learn, to teach and to help. The key task for districts designing such programs is to keep the structure flexible enough to invite and support a range of people in their efforts, while at the same time providing essential resources, support, and focus.

The Seed Teachers feel positive about their own learning and their contributions. They feel taken seriously as professional educators who will learn and lead. Traditions have developed which pair learning opportunities to service in the school and this seems like a fair trade to most people. If the position rotates, other teachers see a diversity of teachers in the role, not just "tech. wizards." As the agents and the targets of change, the district concentrates information and educational experiences on them, so that they will pass it on.

Immersion in problem-solving and helping peers is strongly motivating to volunteer Seed Teachers and causes their personal learning to increase dramatically. If the role revolves through staff members and an ethos of help and support is cultivated, teachers are able to learn to use computers. The requirements for the role combined with personal learning and the building context produce the outcomes. Most of the requirements and incentives center around the learning of the Seed Teacher, and Seed Teachers did learn more than they might have in other ways. Some district observers hope that classroom teaching will change dramatically, yet there is little in the required activities which promote direct changes in the classroom. If a key part of learning and teaching is problem-solving and collaboration, this program provides experience in problem-solving and collaboration for teachers. If matched with times for reflection and support for teaching, further changes might be expected. Seed Teachers learned about computer technologies, and about working in the larger arenas of the school and district. The Seed Teacher role is a rich experience largely made up by each individual on the job. People on a continuum from beginner to expert can contribute to their schools and increase their personal learning.

## **Chapter 10**

### **Conclusion**

As public schools use computer technologies in order to improve student learning, they often look to research for information on best practices. A body of research is growing which examines technology in schools, and professional development which supports its implementation. The introduction of computers into schools is happening in the context of public scrutiny of education and the effort to systematically reform schools. Teachers are widely considered the key to improved learning for students, and efforts are underway to improve schools, by professionalization and/or by prescription. The details of implementation efforts often confound the plans and orderly visions of innovators. In the details are found the messy and complicated realities of learning and teaching in classrooms, and lessons can be drawn from what happens there. Chapter 10 concludes a research project studying the impact of a particular model of staff development for technology enhancement on its participants, in the context of their daily lives and teaching practice.

A summary of the research begins with key findings from relevant literature, follows with a short description of the study, and lists major findings of the study. The limitations of the research are explained and suggestions are made for further research. Implications of the research are developed for school districts implementing the use of computer technologies. Concluding remarks sum up where this study fits in the emerging literature on professional development for computer technology implementation in schools.

#### **Summary of Research**

##### **Key Findings from Literature**

Because this study examined the impact on teachers of taking on a role as technology lead teachers, literature was examined in the areas of professional development, teacher leadership, and technology and teachers in K-12 schools. Teacher learning is essential for change to occur in schools. New curricula are implemented and new methods successfully adopted when teachers are provided with training, ongoing support, access to adequate resources, time to learn and practice, and an environment which is collegial and focused on student learning. Teachers consistently report that they are motivated by increased student

learning, that they are willing to invest time if they feel like it pays off in the classroom, and that they like to learn from and with other teachers.<sup>1</sup>

Barriers to any implementation effort include the complexity of making curricular change, the isolation teachers experience in classrooms, the lack of time to experiment and explore, lack of ownership in top-down mandated efforts, lack of critical support for classroom-initiated efforts, inadequate ongoing assistance, and ignorance of theories of change. Barriers related specifically to technology integration include innumerable issues related to cost, lack of functional access, inadequate plans for sustainability of technology effort, and all of the complexities associated with use of rapidly changing technologies.<sup>2</sup>

When the goal is improving schooling with technology, researchers recommend the need for a change in beliefs about teaching and learning; administrator use and support of technology; effective staff development which is continuous and available at the local site; local teacher leaders trained in technology integration; a school-wide technology integration plan; and collaboration among colleagues and outside the schools.<sup>3</sup> Especially important in successful implementation is the creation of a coherent school-wide approach to using technology in the core curricula for all students. A recent research report recommended that schools plan for and create a growing snowball effect among technology learners and users by providing access to 6-8 computers per classroom, and giving teachers time to learn, teach, and experiment.<sup>4</sup> A typical teacher might look at a list such as this and respond with a sarcastic laugh. Between recommendations for optimal implementation and actual district possibilities are many small experiments and modest solutions. Most districts construct programs and supports with unsure or inadequate funding, and there is interest in middle-level solutions to difficult problems. Such a middle-level program is the focus of this study.

### **Description of Research Study**

As districts look for ways to integrate computer technologies into schools, the focus is on teacher training and ongoing support for teachers and students. Some districts are interested in using their own staff as experts and in developing leadership in the teaching corps. Vista, a Pacific Northwest school district working on school restructuring and computer implementation, has operated a program of technology lead teachers for the last twelve years. The technology lead teachers, called Seed Teachers, take on the responsibility of helping their peers and working with technology issues in exchange for a stipend and numerous learning opportunities in two-year terms of service. The program is

centrally administered but building-based, and operates a little bit differently in each school. Administrators hope that teachers will learn to use computers and help their colleagues learn, so that eventually students will learn with computers. There is an expectation that Seed Teachers will be leaders with technology in their classrooms and model the best ways to teach with technology.

To understand how participation in the program affects them, a study was conducted involving case studies of seven technology lead teachers in three schools. The teachers were observed teaching in their classrooms, assisting peers, participating in district meetings, and in most cases, working at home. They kept and discussed work logs, and were each interviewed four times. All of the 31 technology lead teachers in the district filled out a questionnaire about their work as Seed Teachers. Seventy-seven colleagues of the technology lead teachers in the three schools answered a questionnaire about their perceptions of the Seed Teachers and their opinions about the program. Interviews were conducted with two or more colleagues at each school and with each principal. Also interviewed were district administrators and technology leaders.

Information from each case was used to write portraits of each teacher and to compile information about each as a learner, helper, and teacher, with attention to what supported and constrained them in each effort. Teachers were examined in the context of their schools, to note the effects of administrator involvement, level of collegiality, level of technical expertise, and resources available. It was assumed that the participation of each teacher was influenced by the social context of the district and the school, by the characteristics of the Seed Teacher program, and by the personal characteristics of each Seed Teacher. The focus of the study was on each teacher as a participant in the program, looking at activities, attitudes, and skills, and how participation effected their approach to helping, learning, and teaching.

### **Summary of Research Findings**

Participants were selected for this study because of their differences and an effort was made to locate "naturally occurring points of contrast that can be observed as natural experiments."<sup>5</sup> The Seed Teachers had some reactions in common, most of all their commitment to the job and the importance they attached to it. What was helpful and hindering to them was different from person to person.

### **What Supports and Constrains Learning?**

Most of the provisions of the Seed Teacher program are learning enablers, including provision of a stipend to purchase a home computer, and requirements to take two classes, attend four all-district meetings, and attend a computer conference. The goal is that investment in learning opportunities for the Seed Teacher will produce learning opportunities for colleagues and students. Besides the formal training, the gist of the learning is "learning by doing." It is assumed and it happens that Seed Teachers take on problem-solving tasks and learn from them. Seed Teachers all said they became Seed Teachers to learn, and that they felt the position "forced them to learn." Each reported an increase in their skills with computers and in their problem-solving skills.

Constraints involved the difficulty of constructing a personal course of learning, the confusion in buildings about what they should be able to do and not do, and flexibility allowing some Seed Teachers to opt out of opportunities that might have been helpful to them. Teachers reacted in different ways to the opportunities they had, as what was exciting for one was too confusing for another. Finding time to learn was a problem for all of the Seed Teachers and time was the one thing they asked for consistently and with the loudest collective voice.

### **What Supports and Constrains Helping?**

In their helping role, Seed Teachers were troubleshooters, inservice providers, messengers, technology coordinators and inventory managers. They obligated themselves to work in order to learn. They all worked solving technical problems for and with their peers. It was expected that helping others would drive their learning and it did. All of the Seed Teachers tried to solve problems for others that they would not have attempted on their own. They understood themselves to be on view as problem-solvers and this was a motivation to persevere. Seed Teachers were given two release days each year to work on issues of their choice in their buildings. They all contributed many hours of service to their schools. Seed Teachers were motivated by the opportunity to be helpful and by the thanks and recognition they received. They enjoyed wider horizons, entering the world of computer technologies, taking on a teaching role with peers, interacting with others across the district, and coming out of the classroom to see the whole school as their arena of work. All of the Seed Teachers depended on their partners and felt they would not do the job alone.

The major constraint faced by all Seed Teachers was lack of time to help, and being overwhelmed with troubleshooting tasks. They felt that the job had outstripped their ability

to do the work and they wished they had either more time to do the job or help from students or paid classified employees.

### **What Supports and Constrains Teaching?**

Seed Teachers are expected to be model learners and teachers with technology. Most of the technology leaders in the district are current or former Seed Teachers. District administrators and Seed Teachers themselves talk about changing how they teach and becoming "guides on the side." However there is no direct requirement related to teaching in the Seed Teacher contract, and two schools have just appointed classified assistants to be their building Seed Teachers. There is talk and excitement about the teaching of a few Seed Teachers in the district, but little support for major changes in classrooms. Some Seed Teachers accumulate extra technology in their areas, but most have only one or two computers in their classrooms. They are encouraged to do model teaching in their schools, but most do not. Most of the Seed Teachers think that the structure of schooling is stable and they do not project that teaching and learning will change dramatically in the next ten years.

When teachers become Seed Teachers, they tell themselves they will focus on technology. Seeds reported some pressure to visibly work with computers with their students. When they attend meetings and conferences, some Seed Teachers learn from others about classroom applications and new ideas. However, there are major constraints on learning to teach differently and on helping each other teach.

The Teacher Development Centers<sup>6</sup> associated with the Apple Classrooms of Tomorrow found that "the professional journey from instructionism to constructionism and to effective integration of technology is generally slow and arduous, and requires a high level of support. Typically teachers begin using technology to replicate old patterns of instruction; it is often years before they progress to the stage in which they truly integrate technology and use these tools to their fullest potential." . Most teachers have not seen successful ways to organize classrooms and teach effectively with computers. They catch glimpses in articles and movies, but mostly they try a little of this and little of that.

In order to get teachers to change their practice, the Teacher Development Centers found that the training model has to directly address the philosophy of constructivism, and alternate information with directed observations and helping in computer-intensive classrooms followed by focused discussions and culminating in personal planning for classrooms.<sup>7</sup> This situated teacher development allows learning teachers to observe new ways of classroom organization to be experienced as observers and as participants. Seed

Teachers are learners and experimenters with technology, but they are not involved in anything close to an immersion in active learning classrooms with a focus of changing beliefs and increasing skills. While district administrators refer to the ACOT research among other positive visions for computers in school, it is with no follow-up actions which would lead to transformed classrooms.

In learning to teach differently, teachers need visions of other possibilities, increased skills, time to experiment and practice, whole school focus on learning and the support of their peers. All of these features are not a part of the Seed Teacher program. Some Seed Teachers change their practice with computers, like Ned in this study, but he incorporated computers into his practice because they fit with his established practice and beliefs. Three of the teachers in this study, Cindy, Barry, and Jack, teach in traditional ways, and much would need to change for them to alter their practice.<sup>8</sup> As Honey and ACOT researchers<sup>9</sup> have pointed out, teacher beliefs about organization of student learning are the dominant characteristics in the change or non change of classroom practice with the addition of computer technologies.

The conceptual framework for this study was constructed after studying administrator and Seed Teacher expectations for the program. It assumed a link between being a Seed Teacher and the ways teachers learn, help, and teach. In fact, their participation greatly affected them as learners and helpers, but made only a small visible impact on their teaching. It is possible that there are long-range effects which were not immediately discernible.

#### **Four Themes of Being a Seed Teacher**

Participation in the Seed Teacher program was an important commitment for each of the teachers studied. Ultimately, there were four themes of the experience that emerged as important to all of them. Being a Seed Teacher was a positive opportunity to learn and to help in their schools, it offered recognition for doing an important job, it involved long-term immersion and investment in a task, and it provided expanded access to people and resources.

##### Positive Opportunity to Learn and Help

Seed Teachers take the position because they want to learn. They voluntarily commit themselves to service to their colleagues and school. Because they take the job seriously and want to solve problems as they arise, they consider being a Seed Teacher, being "forced to learn." The Seed Teachers also take seriously the obligation to help their

colleagues. While they are frustrated by the workload, they are conscientious about helping. The obligation taps into the teachers' idealism, and ultimately why they teach. This is the dynamic referred to by Michael Huberman as the "intrinsic altruism and idealism that permeate the educational enterprise and mobilize people to take on moments of uncertainty in the name of something larger than their individual interest."<sup>10</sup>

Whether it is or is not a true fact, computers for these teachers are associated with increased opportunities for student learning. Computers function as a mostly unquestioned symbol for progress and success. Seed Teachers took classes, went to conferences, worked with TEK students, and stretched themselves as learners in order to be helpful. Most Seed Teachers find themselves as uncomfortable and conscious learners, struggling to figure out problems on new turf, in front of their colleagues. For some, this is a big moment of being off-balance and aware of themselves as learners. They do not spontaneously make the links to the experiences of student in their classrooms, but they could be helped to do so. If we believe that it is impossible to create a good learning environments for students without creating good ones for teachers also, and that learning happens when we confront unknown dilemmas, then supporting learning in a role like Seed Teachers is a good idea.<sup>11</sup>

McLaughlin<sup>12</sup> writes that teachers have no distinct markers of success in their practice. Their whole work life is ambiguous and when they receive concrete information about areas in which teaching practice can be improved, this is a powerful motivation for teachers. A recent survey of public school teachers showed that 70% of the teachers think of computer skills as an essential part of the curriculum.<sup>13</sup> The pollster, Steve Farkas of Public Agenda, reported that "computer skills emerge from the pack because the teachers connect that with survival in the real world." The Seed Teachers express just this positive kind of thinking about students and computers. They are eager to learn specific ways to work with students and computers. Cindy said she would take a class every Saturday if one was offered. The educational promise of an innovation and the opportunity for professional growth are crucial factors in generating teacher commitment. The Seed Teachers believe in the promise of computers and are eager to learn.

#### Personal Recognition for Important Job

All of the Seed Teacher expressed a belief that working with computers is an essential skill for teachers and students. They attach an importance to bringing computer use into the schools which is greater than that of most new curriculum innovations. Computers hold a symbolic importance for Seed Teachers, as they represent enhanced

capabilities and the future. Because they think that it is so important to work with computers, they are eager to help colleagues and work in their schools to bring in more technology and devise good systems for its use. Some of the teachers considered themselves experts and leaders with technology and some considered themselves more as helpers and guides. All of them enjoyed the recognition they received and the identification as being a computer specialist or spokesperson.

Researchers in several studies emphasize that one of the factors sought by teachers in building satisfying careers is the chance to expand their job or role, and try out different roles and types of responsibility while still remaining teachers. Seed Teachers take this opportunity.<sup>14</sup>

The scale and climate of the elementary schools allowed the Seed Teachers to have a job in a do-able arena and to make the personal connections to their peers which motivated them to learn and to help. Huberman<sup>15</sup> points out that "elementary schools are emotional hothouses in which the interpersonal dimensions of managing change are most important." On questionnaires and in interviews, Seed Teachers indicated that they personally helped the majority or the entirety of their colleagues. They were able to work in the classrooms of colleagues and work together on whole school issues. This is a different kind of connection for teachers in a school and Seed Teachers liked it. Boles and Troen<sup>16</sup> advocate teacher leadership roles in which teachers can be entrepreneurial, experimental and generative. As teachers make themselves into Seed Teachers in their buildings, some exercise these qualities.

#### Long-term Immersion in Role

Seed Teachers take on a two-year commitment. They agree to focus on technology issues for two years. It is important to them that they are part of a long-running program in the district, and that the district and building are making a two-year investment in them as learners. The time gives importance and weight to the position and makes it seem possible. It also doubles the incentives as Seed Teachers receive two stipends, four classes, two sets of release time in buildings, eight meetings, and two computer conferences. They were able to work over time with the teachers in their buildings, with their principals, and technology committees. They had a summer or two in which to take classes or practice their own skills. The two year period seemed to Seed Teachers to be a reasonable time in which to learn and contribute.

All of the teachers in this study are experienced teachers who have taught in several places and situations. Even when they were expressing frustration over not having

enough time or support to do the job, Seed Teachers were pleased with the commitment the district made to them and by the district's long-term commitment to the Seed Teacher program. In most teacher's experience, programs come and go as funding waxes and wanes and administrators change. However the Seed Teacher program has lasted through a district budget crisis, the exit of key administrators, and the addition of a new technology direction for the district. They view the program as a rare example of investing in teachers and they are honored by it.

#### Expanded Access to People and Resources

Taking the Seed Teacher position opened many horizons for the teachers. They stepped into the world of computer technologies, reading computer magazines, and learning about new equipment and challenging new possibilities. They also came out of classrooms and concentrated on the whole school in their Seed Teacher role. They had permission and invitation to go into every classroom and work with all adults and groups of students in the school. When they worked with technology committees, they learned about budgeting and school politics. Even working with and supervising high school TEK students was a stretch for many elementary school teachers. They enjoyed meeting with Seed Teachers and administrators and technicians across the district. The Seed Teachers who formed the most connections with people in and out of their buildings were the most satisfied with their work.

By focusing on technology, many Seed Teachers brought new computer resources into their classrooms and schools. They helped make decisions about hardware and software. Seed Teachers felt an obligation to work with technology with students and so they increased the visible use of computers in their classroom work.

#### Limitations of Research and Suggestions for Further Research

The purpose of this research was to investigate the impact of being Seed Teachers on the learning, helping and teaching of the participants. The Seed Teacher program is intended to be a learning opportunity and leadership development role for Seed Teachers, to bring help and assistance about computers to teacher colleagues, and to impact the learning of students in classrooms. This research focuses on the work and learning of the Seed Teachers. It is not an evaluation of the program, an analysis of its impact on students, or an examination of its effects on colleagues in the schools.

The research design would probably have yielded stronger results if it had been conducted over the course of a whole school year, instead of during the second semester only. A longer time period would have enabled me to build in more observations and reflection points with the Seed Teachers.

A puzzling outcome is the limited visible impact in classrooms, so I would pursue this issue further with current and former Seed Teachers. The ultimate goal of the Seed Teacher program is to integrate computer use into the core work of classrooms. It is assumed by administrators that enabling teachers to learn will produce increased learning opportunities in classrooms. Besides "pie in the sky" talk, not much in the Seed Teacher program or contract focuses directly on teaching in classrooms. Some studies indicate that for technology to be impactful in classrooms, schools have to acquire 6-8 computers per classroom or some equivalency, provide ongoing training and support for teachers, and tie all of the effort together with a coherent building-wide plan.<sup>17</sup> Vista provided computer workstations for teachers, online libraries, access to the Internet, and a trickling amount of computers coming into schools for students. As learners, Seed Teachers were the recipients of technology and opportunities and were placed in situations where they had to continually learn by solving problems. The richness of their personal learning was not matched by an equally potent focus on classroom learning and teaching. Seed Teachers had minimal opportunities to observe powerful teaching with computers, examine their own practice, or reflect on their own learning and that of their students.

Most Seed Teachers are personally challenged by the work of being a Seed Teacher. They experience the disequilibrium of being out of their element and over-their-heads, feeling like vulnerable new learners. If some of their time were structured into a focus on teaching and learning, they might translate some of their own learning into their classrooms. It is not the case that there is no impact in classrooms, it is that the impact seems minimal compared to the espoused outcomes and hopes administrators and teachers have for themselves. I would like to further study the impact of specific strategies on classroom teaching.

The particular format of technology lead teachers studied in this research was a high-test mix of opportunities and pressure for the teachers who participated. The district in which the program occurs is trying to identify the critical components of the program, and are even considering whether to end the program and start something new. The concern is how to get more help with technology into schools, and much of the need is for immediate technical help. Teachers want classified assistance, but they want enough help to make a difference. Seed Teachers in Vista schools are willing to invest mightily in their

own learning and in service to the school when they feel like they are taken seriously. Further research is needed to discover combinations of requirements and incentives which are affordable, sustainable, and move teachers toward better teaching practice with the use of computer technologies.

### **Implications for School Districts Implementing Computer Technologies Using Technology Lead Teachers**

The work of the Seed Teachers, as they learn to use and teach with computer technologies, provides insights into the complex relationships and structures in place in schools and the meaning teachers give to their work. The Seed Teachers in the case studies and others in the district reveal what is meaningful and supportive to them and what is not. As school districts implement computer technologies in schools, some implications may be drawn from the experiences of technology lead teachers as they learn, help, and teach.

### **Technology Lead Teachers Only One Piece in the Technology Puzzle**

The use of technology lead teachers is a powerful strategy for providing intensive learning opportunities for a growing number of teachers, and simultaneously infusing help and support into school buildings. It is one strategy a district can use along with others. Since the beginning of the Seed Teacher program, there have been multiple expectations of the role. On the one hand, buildings desperately need help with technology issues, and want someone to do the work. A Seed Teacher who becomes an expert user and helper can be of great assistance to peers. On the other hand, the role is supposed to develop growing expertise in the building by rotating between teachers every two years. It is hoped that new teachers will keep taking on the role, increasing their skills, and passing the role on to others. If novices take on the role, and the emphasis is on their learning, there could be needs unmet among their peers who need assistance. Different buildings have developed different traditions with the Seed Teacher role. Two of the schools in the study developed an expectation among staff that all were welcome to become Seed Teachers and be learners. The other school did not have this tradition in place, and neither did other schools in the district. In one school, a fellow is on his seventh year as Seed Teacher, and that building has traded the learning role and a growing level of group expertise for immediate help from an expert.

Seed Teachers enjoyed their reputations as computer experts, even if they were not sure they could live up to expectations. They took the positions to expand their options and influence. They enjoyed being of service to their schools, but they did not take on the job to be clerks or technicians. A continuing problem facing Seed Teachers and the district is to find multiple ways to get troubleshooting help into the schools.

A plan for multiple strategies for learning and support for all teachers might include:

- \*broadening experiences which expose teachers to what is possible
- \*exploration activities in which teachers try new software, hardware and techniques
- \*planning consultation opportunities to work with a colleague/expert in locating resources, planning activities, and getting feedback on progress
- \*just-in-time training on identified software, hardware, and uses of technology
- \*ongoing support for questions on learning, maintenance and repair.<sup>18</sup>

Some of these functions could be supplied by technology lead teachers such as Seed Teachers and others could be offered throughout a district through electronic helplines, district classes, and in building technical help from classified staff or students. A most important element for integrating computer technologies is the use of a school-wide plan and an all-school focus on student learning.

### **Varied Incentives Focused on Learning May Enhance Change in Practice**

Because there is no one best way to help teachers learn and change the way they teach, a district would logically offer a range of incentives. Lessons from the experience of Seed Teachers indicate that a focus on learning is a good one. Seed Teachers experienced incentives and requirements differently. A large amount of flexibility which allowed some Seed Teachers to define their own roles and help and learn successfully in their buildings, was experienced as too little support and direction by another. An issue for Seed Teachers and administrators to work on is developing support systems for Seed Teachers in their buildings. The flexibility of the program is experienced more positively than negatively, but most of the Seed Teachers said they needed help and direction. They needed access to technical and pedagogical help, including training in the change process and organizational skills.

### **Obligating Teachers to Help Pressures Them to Learn**

It is a reasonable expectation that teachers who facilitate the learning of children would do the same with colleagues. When teachers take on a voluntary obligation to be helpful in their school, they often contribute hours and hours of learning and labor for recognition and opportunities. A lead teacher role which emphasizes learning by doing provides incentive to the teacher to learn and practice in an active role which many hope teachers will facilitate for children. If teachers take on an obligation to help, it is important that the task be manageable and that they have assistance or support in completing it.

### **Teaching Practice a Target for Change**

If the goal of a lead teacher program is to produce changed teaching practices with technology, a possibility would be to directly support and emphasize the teaching. Computers are seen by many to be the catalyst by which classroom environments will become more active and student-centered. Some technology-using teachers have altered their classroom practice and function as inspiration and models for others. Most researchers believe that teachers will change their classroom practice only over a number of years with access to adequate amounts of technology, ongoing support, and specific work focused on learning and teaching. Acting as a technology lead teacher places teachers in an active learning condition and is a readiness platform for a focus on transformed teaching and learning.

### **Collaboration a Positive Factor in Teaching Improvement**

Teachers in most schools do not have a structure and habit of working collaboratively on teaching. When technology lead teachers help their colleagues, they are able to talk about technical problems and sometimes pedagogical ones. It is important to Seed Teachers that they work with partners, and that they develop networks of people who can assist them inside and outside of their schools. Combinations of job-share possibilities and use of specialists paired with classroom teachers enable elementary teachers to work together. Principal support is crucial to technology efforts in general and in particular to providing time and dollars for collaborative work. Lead teachers can be encouraged to form deliberate help networks in and out of school, either meeting electronically, by phone or in person.

### **Expertise Builds Up in Each School**

Changes in skill and practice require continuous support. It is helpful to build up a growing expertise in a school and to purposely cultivate an atmosphere focused on teachers helping each other. Bringing technology into classroom practice is difficult technically and pedagogically. Teachers need assistance with the software and machines, and they need help envisioning new ways to teach with technology. It is a benefit to rotate technology lead teachers so that expertise is shared between many staff members. Teaching with technology takes many forms and an emphasis on increasing expertise among all staff people brings more styles and options into the school.

### **Administrators Enable or Constrain Technology Growth**

Researchers have found that administrators are critical figures in the integration of technology into schools and say it is important that they be skilled personal users of technology; that they have a vision of integrated technology in teaching and learning which they advocate in the school and public communities; that they obtain resources; provide recognition and encouragement to teachers and students; and monitor efforts by meetings and active work with teachers.<sup>19</sup> Building administrators who build and practice their skills alongside teachers become visible users and champions of uses of technology. Districts can promote administrator learning with job-alike user groups, electronic bulletin boards and discussion groups, and by employing "technology personal trainers" to come into principal offices and work one-to-one with principals in organizing their work habitat and routines with technology.

### **Conclusion**

Seed Teachers talk about and demonstrate their engagement in learning and helping, the importance they attach to the role and the pleasure they take in recognition. They use the resources available and appreciate the long-term nature of the commitment they make. The model of Seed Teachers developed in Vista School District includes computer users and teachers of all skill levels and ranges of experience. It enables technical wizards to excel and serve their schools and it nurtures beginners and encourages their growth.

Notably missing in the bulk of experiences and comments of the Seed Teachers is a focus on teaching, changed classrooms and altered teaching practice. District leaders,

principals, and Seed Teacher founders describe the program in terms of increasing learning opportunities for students. They see the program in terms of teaching teachers so that they will teach students. They hope to create technology enthusiasts and experts by investing in teacher learners over time and hope to support activity in the buildings through the direct help and assistance provided by the current and former Seed Teachers. There is a wishful assumption that the introduction of a few computers and a modest investment in the incentives for Seed Teachers, combined with very slow acquisition of hardware and software in classrooms, will dramatically change classroom practice. There are few specified components in the Seed Program which directly facilitate enhanced classroom practice and yet there is a hope that it will occur.

Observations of teachers in classrooms reveal the minute-by-minute work they do with a roomful of students and the minor place computer technologies play in the mix. Being a Seed Teacher is a big obligation and investment for the teachers involved, but it is an add-on role compared to the press of classroom obligations and duties. Teachers, like other social service professionals, are street-level bureaucrats who work in pressure-packed places. They are continuously confronted with:

- multiple competing demands
- chronic resource shortages
- intense client interactions
- diverse constituency expectations
- incessant pressures to make consequential decisions
- intermittent challenges to their physical and emotional safety

Under these conditions, innovative policy of any sort tends to be converted into familiar practice, not because individuals are lazy, inept, or recalcitrant but because the pressures of the workplace overpower the provisions of policy.<sup>20</sup> On the other hand, while classroom practice is not dramatically altered, teachers report the Seed Teacher experience to be a powerful one, which engages them in learning and engenders their commitment.

Recent studies of technology implementation and ongoing studies of curriculum reform cite the difficulties involved in changing the key features of teaching and learning in classrooms.<sup>21</sup> The learning model exemplified by Seed Teachers fuels personal learning by a volunteer obligation to help and to be a visible model of technology use. Teachers integrate computer technologies into their teaching practice according to the resources available to them, and based upon their beliefs about student learning. Ultimately, what we want for teachers is what we want for students, an "array of learning opportunities that

engage students in experiencing, creating and solving real problems, using their own experiences and working with others" (Lieberman).<sup>22</sup>

The Seed Teacher program is offered to teachers with the flavor described by Lightfoot<sup>23</sup>

"directed toward teacher sustenance at a time of retrenchment. This requires a clear view of the socioeconomic barriers as well as a recognition of the potential for teacher inspiration and renewal. Those whose primary job it is to nurture and stimulate inquiring young minds must themselves be offered rewards and nurturance. They too must experience the difficulties and exhilaration of confronting new ideas, and occasionally be once again in touch with the vulnerable and subordinate role of student."

Teachers need to continually work through ideas about teaching and learning and the Seed Teacher program puts teachers in the middle of the path to school reform. It is a piece of what researchers say is needed. It has many positive elements for teachers, including multiple opportunities for active problem-solving, the promise of impact in the classroom, long-time investment in learning, and a disequilibrium which makes teachers ripe to think about new ways to learn and teach. While it is just one piece in the technology implementation puzzle, it is a powerful one. As Eloise says about the program and its stance toward teachers, "It's hopeful." We wish for all of the teachers what Grace says the program does for her, "It makes my brain more alive."

**Notes to Chapter 10**

- 1 (Fullan & Stiegelbauer, 1991; Office of Technology Assessment, 1988; Office of Technology Assessment, 1995; Sheingold & Hadley, 1990)
- 2 (Fullan & Stiegelbauer, 1991; Means, 1994; Means, Olson, & Singh, 1995; Office of Technology Assessment, 1988; Office of Technology Assessment, 1995; Sheingold & Hadley, 1990)
- 3 (Apple Classrooms of Tomorrow, 1995; Apple Classrooms of Tomorrow, 1996; Dwyer, Ringstaff, & Sandholtz, 1990; Knapp & Glenn, 1996; Office of Technology Assessment, 1995)
- 4 (Means, et al., 1995)
- 5 (Wolcott, 1994, p. 352)
- 6 (Ringstaff & Yocum, 1994)
- 7 (Ringstaff & Yocum, 1994; Yocum & Wilmore, 1994)
- 8 (Apple Classrooms of Tomorrow, 1995; Apple Classrooms of Tomorrow, 1996; Dwyer, et al., 1990; Honey & Moeller, 1990; Knapp & Glenn, 1996; Office of Technology Assessment, 1995)
- 9 (Dwyer, Ringstaff, & Sandholtz, 1990; Honey & Moeller, 1990)
- 10 (Huberman & Guskey, 1995)
- 11 (Sarason, 1990)
- 12 (McLaughlin, 1994)
- 13 (Associated Press, 1996)
- 14 (Boles & Troen, 1994; Lieberman, Saxl, & Miles, 1988; Little, 1988; McLaughlin, 1993; Yee, 1990)
- 15 (Huberman, 1993)
- 16 (Boles & Troen, 1994; Troen & Boles, 1994)
- 17 (Means, et al., 1995)
- 18 (Office of Technology Assessment, 1995; Willis, 1993)
- 19 (Kearsley & Lynch, 1992; Office of Technology Assessment, 1995; Willis, 1993)
- 20 (Lipsky quoted by Malen, 1992)
- 21 (Apple Classrooms of Tomorrow, 1996; Ball, 1996; Darling-Hammond, 1996; Wilson, Peterson, Ball, & Cohen, 1996)
- 22 (Lieberman, 1995)
- 23 (Lightfoot, 1983, pp. 258)

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## Appendix A

### Interview Questions

#### QUESTIONS FOR SEED TEACHERS

##### Interview One-Biography

1. What do you teach?
2. How long have you been a teacher?
3. Please tell me about your teaching career?
4. How long have you been in this school?
5. If you could use 10 words to describe teaching in this school, what would they be?
6. Would you please describe your computer-using skills?
7. Describe how you use computers in your teaching?
8. Why did you become a Seed Teacher?
9. Is this your first or second year?
10. What are your duties as a Seed Teacher?
11. Please describe the Seed Teacher program.
12. If you could use a metaphor to describe the program, will you please describe it now.
13. What are your goals for yourself as a Seed Teacher?
14. How is it going in relation to these goals?
15. How do you and your partner in this building work together?
16. Have other Seed Teachers working in this building? Can you see an effect of their work?
17. How are you preparing to work as a Seed Teacher this year?
18. How do you think being a Seed Teacher will effect your classroom?
19. How will being a Seed Teacher affect your relationships with other teachers, students, and your principal?
20. Do you anticipate that being observed and keeping a log of your Seed Teacher activities will have any effect on your work?

##### Interview Two

1. What have you done this week in your Seed role?
2. Do you have any new awarenesses about it in light of our conversations?
3. Could you please draw a picture that represents the Seed ideas.
4. What needs are intended to be met by this program?
5. Describe what has happened in your building as a result of your tenure as a Seed Teacher?
6. What did you do this week as part of your Seed role?
- 7.. Thinking about the program as it has developed, what are the benefits of this program to:
  - the district?
  - each school?
  - teachers?
  - students?
  - Seed Teachers?
  - Other?
8. What do you see as the future of the program?
9. How have you been helping students and staff?
10. What have you been learning about computer technologies?
11. What have you been learning about teaching with computer technologies?
12. What have you been learning about yourself as a helper?

##### Interview Three

1. If you were to look at the District in 10 years from now, what would you see that might have been affected by the Seed Teacher program?

2. How does it fit in with ~~being a Seed Teacher?~~
3. What do you like about ~~being a Seed Teacher?~~
4. What are the drawbacks?
5. What are the drawbacks or limitations of this strategy?
6. What are your beliefs about how teachers learn new things and use them in teaching?
7. Are these beliefs reflected in the Seed Teacher program?
8. What have you done this month in your Seed role?

#### **Interview Four**

1. What did you do this week as part of your Seed role?
2. Has being a Seed Teacher affected your relationships with:
  - your principal?
  - other teachers?
  - district office staff?
  - students?
  - parents?
3. Since you've been a Seed Teacher, what have you noticed about yourself as a learner?
4. How has it affected your problem-solving skills?
5. If you were making a documentary about the Seed Teacher program, describe the vignettes you would film to tell the story.
6. What advice would you give to a new Seed Teacher?
7. If you could design a program to infuse technology into each building, what would you do?
8. Are there important parts about the Seed Teacher program we have not discussed?
9. How would you describe yourself as a Seed Teacher, based on your hopes for yourself?
10. Describe yourself and your teaching five years from now.

#### **QUESTIONS FOR TEACHERS IN EACH CASE STUDY SCHOOL**

1. Will you describe the Seed Teacher program?
2. Is the Seed Teacher program a benefit to you in this school? Describe.
3. Have you asked your Seed Teachers for help?
4. Do you think the Seed Teacher program is a good thing for the District to continue? Why or why not?
5. Do you want to be a Seed Teacher?
6. What are the characteristics of a good Seed Teacher?
7. How do people get selected as a Seed Teacher in this school?
8. How many Seed Teachers and former Seed Teachers are in your building?
9. What are the barriers and supports faced by teachers in learning to use and teach with computers?
10. Describe your classroom and teaching five years from now.

#### **ADDITIONAL QUESTIONS FOR PRINCIPALS**

1. How does the Seed Teacher program function in your school?
2. If a film maker came to your school to make a documentary about teachers and students learning with computers, will you please describe the vignettes you would film.
3. What methods do you use for ongoing evaluation of the Seed Teachers?
- 4.

#### **ADDITIONAL QUESTION FOR ASSOCIATION REPRESENTATIVE**

1. What is the MVAA position on teacher leadership positions such as Seed Teachers?
2. Describe

## Appendix B

### Introductory Letter and Consent Form

# UNIVERSITY OF WASHINGTON COLLEGE OF EDUCATION CONSENT FORM

## LEAD TECHNOLOGY TEACHER PROGRAM: PROFESSIONAL DEVELOPMENT FOR COMPUTER USE IN SCHOOLS

Nancy Messmer  
PhD. Candidate  
Curriculum and Instruction

### PURPOSE AND BENEFITS

This research project will study the Seed Teacher Program in . School District. It is conducted in partial fulfillment of the requirements for a graduate degree in Education. Its purpose is to understand the effects of the Seed Teacher program on its participants, as explained by district administrators, founding Seed Teachers, former Seed Teachers, and current Seed Teachers. The experience and learning of Seed Teachers will be the focus of the study.

Many school districts are seeking ways to spread the use and integration of computer technologies in the schools. Knowledge about this strategy will benefit other administrators and teachers. Persons interviewed will benefit from the reflection involved in explaining and evaluating the strategy.

### PROCEDURES

I will read materials generated by the Seed Teacher program. Interviews and observations will occur primarily in January through March of 1994. Four district technology administrators and founding Seed Teachers will be interviewed to determine the nature and purpose of the program and its history. Examples of questions are: 1. Describe the Seed program. 2. What are the benefits to each school? 3. What are your goals for the use of this strategy? 4. What other strategies were considered?

I will conduct case studies of seven Seed Teachers in three elementary schools. Each teacher will be observed in the classroom on three occasions and will be interviewed four times. They will be asked questions regarding the role of Seed Teacher and perceptions about the program and its effect. Observations will be conducted at times when the teacher is working in the role of Seed Teacher, with students and with staff. Each participant will keep a work log and weekly e-mail journal.

In each of the three schools, three other staff members will be interviewed, including the principal, teacher association representative, and another teacher. All certificated staff members in the three schools will be asked to complete a short survey about their use of the Seed Teacher program in a staff meeting.

All district Seed Teachers will be asked to complete a survey about their work as Seed Teachers and their attitudes about the role. I will observe at several all-district Seed Teacher meetings, as well as attend the Technology Information Project meetings as a participant-observer.

Audio tapes will be made of all interviews. The tapes will be summarized and transcribed by the investigator or by a professional transcriber. The material will be coded. Pseudonyms will be used on all identifiers except the name "Seed Teacher". Work will be done on one computer in a locked area. Materials will be kept in this area. Any reports or papers resulting from the study will continue the use of pseudonyms, including a report about the research to the school district.

Participants may refuse to answer any question or item in the interviews. A participant has the right to request to review the audio tape and delete any portions.

**RISKS, STRESS, AND DISCOMFORT**

I do not foresee any risk or stress or discomfort. Interviews will be scheduled at the pleasure of the participants. No experimentation is involved.

**OTHER INFORMATION**

The data will be confidential. Identifiable data will be available only to the investigator and the transcriber. Audio tapes will be stored securely.

Participants may refuse to participate or withdraw from the study at any time. They may ask questions before signing the consent form. There are no costs involved with participation in this study. There will be 7 primary participants in this study and up to 15 secondary participants (single interviews). Thirty Seed Teachers and about ninety teachers will answer questions on brief questionnaires.

Time required for participation will vary. Interviews with administrators and founding teachers will take from 30-60 minutes each. The case study interviews will take about 60 minutes each and there are four of them. Observations will be two hours each. Time required for the work log and weekly journal would be 10-15 minutes each time.

Nancy E. Mesomer 31 Jan 94  
Signature of Investigator Date

\*\*\*\*\*

**PARTICIPANT'S STATEMENT**

"The study described above has been explained to me. I voluntarily consent to participate in this activity. I have had an opportunity to ask questions. I may review audio tapes and delete any portion. I understand the future questions I may have about the research or about my rights as a participant will be answered by the investigator listed above."

\_\_\_\_\_  
Signature of Participant Date

cc. Participants

## Appendix C

### Survey Of Seed Teachers and Result Charts

#### Seed Teacher Program

When appropriate, please mark more than one choice, or write your own response.

1. 2 Total years as a Seed Teacher?  Elementary  Middle School  High School

2. What are the benefits to you of being a Seed Teacher?

H  
I  
N

- learned 110% about computers + software.
- Teach others what I know + recommend software
- use software in class w/ students.

3. What are the drawbacks of being a Seed Teacher?

B 1<sup>st</sup> year of new school - getting ordered + set up

4. Please rate your computer-using skills before and since being a Seed Teacher.

Before Seed

Beginning A  
 Intermediate  
 Expert

Since Seed

Beginning C  
 Intermediate  
 Expert

E 5. Estimate the percentage of your staff which you have personally assisted this year. 50%

A 6. Is the Seed Teacher program an effective strategy for infusing technology into the district? Why or why not?

A yes - it makes building experts + allows  
B us time to help others.

The federal Chapter Two money, which is the major funding source for Seed Teachers, is always in danger of being discontinued. If this money is cut and the program needs to be changed, it is important that current and former Seed Teachers help rethink the program. Please answer the following questions with this in mind.

7. In your development as a personal learner of computer skills, a helper of your colleagues, and a leader in teaching with computers, what elements of the Seed Teacher program are most important to you?

A  
B  
I

1. computer at home to spend the many hours learning. (no time at school)
2. release time to take care of in-school business + help other teachers

8. Are there elements of the program which could be eliminated or changed?

*no*  
N

9. What improvements would you suggest for the Seed Teacher program?

N

10. The following activities are conducted by some Seed Teachers. Please mark those which you do. After you do so, please circle the three which you consider to be the most important.

Troubleshoot on equipment problems

Keep track of equipment (inventory)

Keep track of software

} *shared*

3.  Teach classes on computer use

1.  Teach classes on specific programs

Teach model classes (demonstrate with kids)

2.  Review and advise about software

Relay information to staff about TIP and technology issues

Advise on technology issues

Liason between staff and TIPsters

Assist with E-mail

Maintain and run computer lab

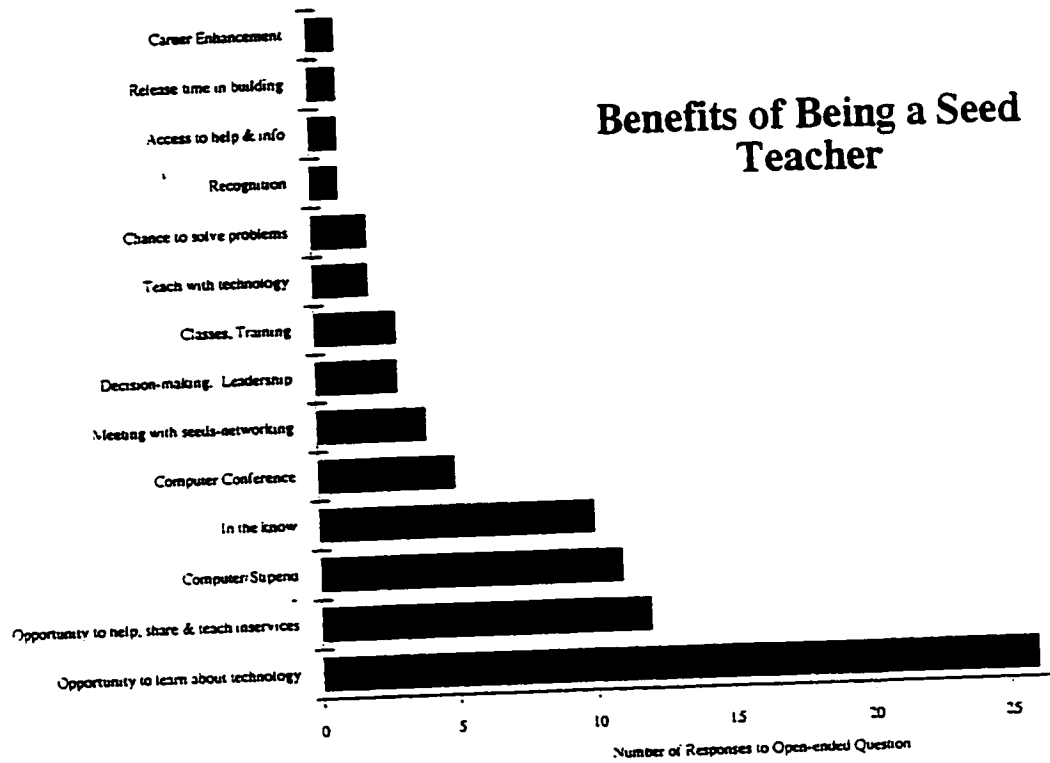
Participate in building and district technology committees

Other *order software*

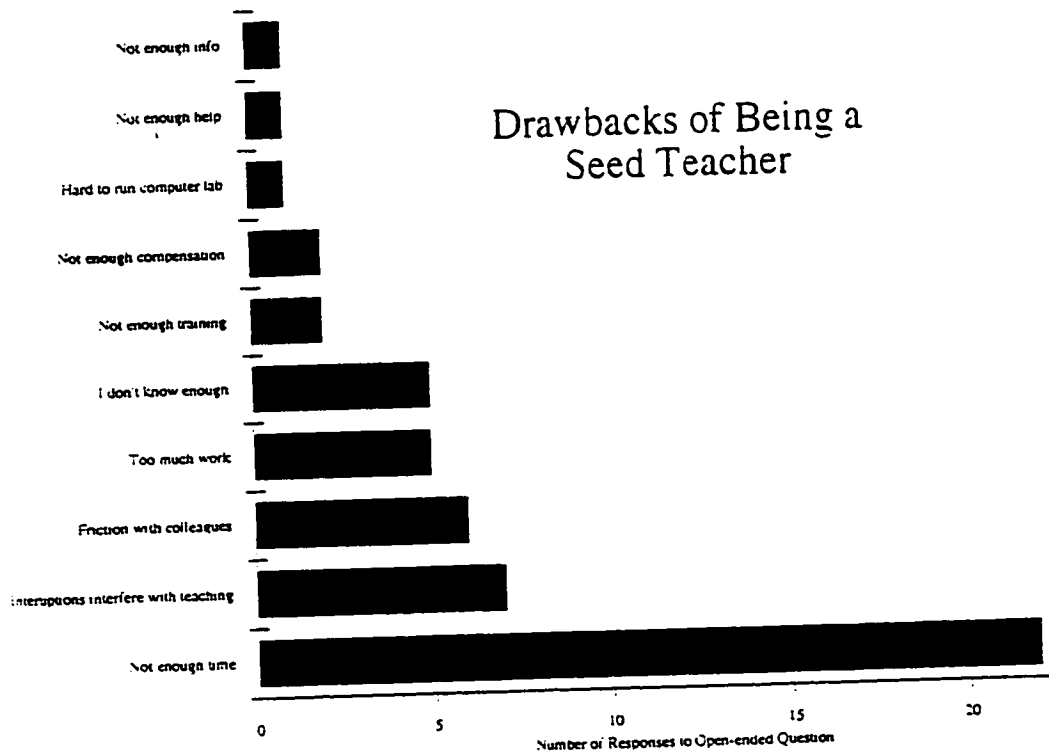
Other *teach @ equipment available in our school*

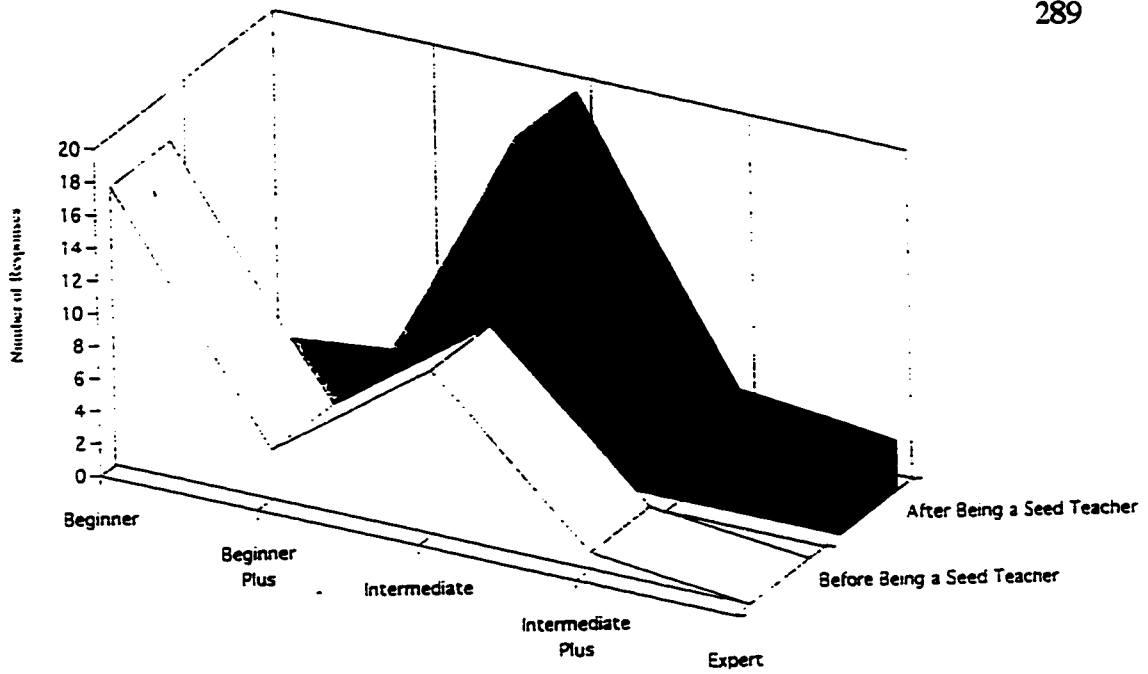
	BENEFITS TO YOU OF BEING A SEED TEACHER	DRAW-BACKS OF BEING A SEED TEACHER	SKILLS BEFORE & AFTER SEED	% OF STAFF ASSISTED THIS YEAR	AN EFFECTIVE STRATEGY FOR INFUSING TECH INTO DISTRICT	WHAT ELEMENTS ARE MOST IMPORTANT TO YOU?	ELEMENTS WHICH COULD BE ELIMINATED OR CHANGED?
BETSY	"Exposure to new technology "Networking with other district staff "A shot in the arm after meetings when I start to feel overwhelmed or stale	I share the passion. I would like full time (pay was computer reimbursement) although I would do share is wonderful too.	Intermediate Intermediate Plus	50%	Yes, especially when supported by the building principal. It all depends on the level of instruction of the Seed Teacher	"The message "Information via Tech centers (a newsletter would be great) "The opportunity to attend conferences	
SYLVIA	"Learning about technology through Seed Teacher meetings and workshopping "Payment	"Very stressful when teaching full time "A lot of work when you know and don't know is large "Inexpensive as any time without working	Beginning Plus Beginning Plus	30%	I guess it is because many people are opposed to technology over the years. However, for me it turned out to be too much pressure so my learning curve went down.	The parts about teaching with computers and software skills and computer skills "Learning teacher involvement	Troubleshooting the technology problems that happens daily or weekly.
NINA	"Learning alot about computers, software and the internet "Learning about leadership roles "It feels good to help others solve their day-to-day problems	"Group (school community) It is hard to make far decisions with a group when everyone is looking out for themselves "Lots of time "Present pressure versus teacher decisions	Intermediate Intermediate	50%	Yes, though I would like to see more training available for others (other than morning presentations)	"The information brought to teachers "Making teachers comfortable with computers and programs so they are willing to work their students using computers	NO!
LISA	It encourages me to learn new skills and gather new information in the area of technology because my classification as Seed Teacher holds me accountable. I'm working with very knowledgeable people.	There can't enough time in the day to accomplish what I feel needs to be done as a Seed Teacher.	Intermediate Intermediate	50%	It is effective when there is not the available funds to hire a technology specialist for each building.	"Problem solving with others "Team teaching to small group then letting that group work others "Coming together as a group to learn new programs/technology, etc.	
CINDY	"Learning new tech. "Learning how to problem solve computer problems	Time to solve problems with teachers is limited.	Beginning Plus Intermediate	50%	Yes, if everyone would eventually become a seed teacher. Otherwise you tend not to be "up" on some things	Being teachers up to a consistent level of computer understanding, catching up with the world	I have a day where I use to teach, implement, solve problems
GRACE	"Shared knowledge "helping teachers	"No time to learn more "No time to teach others "No time to build projects	Beginning Intermediate	100%	Without enough money to reach people by classes, it seems to be the best we can do.		
BOB	"Learn by helping others "Compassion "Keep up on current info.	Not enough help, training, access to info.	Beginning Intermediate	50%	Yes, but the lack of training and access to really help (what do we do when we don't know what we do?) is a serious flaw. Also we should focus more on what to do to integrate computers into the everyday fabric of classroom life.	Most important: working	Not discussed- have created.
SUZANNE	"I'm learning about computers, something I'd been able to avoid for years. "Having my own computer (one that I'm comfortable with) is also a personal benefit as well as a benefit for my school.	Not enough time to help people or find ways to help them.	Beginning Beginning	50%	Yes, it seems to be effective, due to the pyramid type of effect- former seed teachers helping new seed teachers and being able to help less computer literate teachers in their buildings.	Most important element for me: "having an updated computer so I can keep up with technology more easily "having the time to meet with other seed teachers on a regular basis and having time to work with my seed teacher peers (this time has been appreciated by my principal)	Changed: give us more time to work in our buildings
RUTH	"Increased familiarity with technology "Knowledge of latest technology issues	"Never enough time! "Staff tends to "dump" on seed teachers when they are unhappy about technology issues	Beginning Intermediate	30%	Yes, with the usual limitations of our time constraints. I believe we need to increase the resources available to teachers.	resources for problem solving, i.e. Help Desk, James L and Bob Donaldson, Frank	
PAIGE	"To learn the latest in technology and being able to consistently be updated on the newest. "Of course, the stipend also. "I liked the opportunity to attend conferences and classes.	Time	Intermediate Intermediate Plus	50%	Definitely, but there needs to be other ways to get more staff involved in technology. Even though there are classes offered, etc. to them, some still stay uninvolved to learn. Speed and time factors I believe.	Learning the latest in technology and passing on the information to colleagues	

## Benefits of Being a Seed Teacher

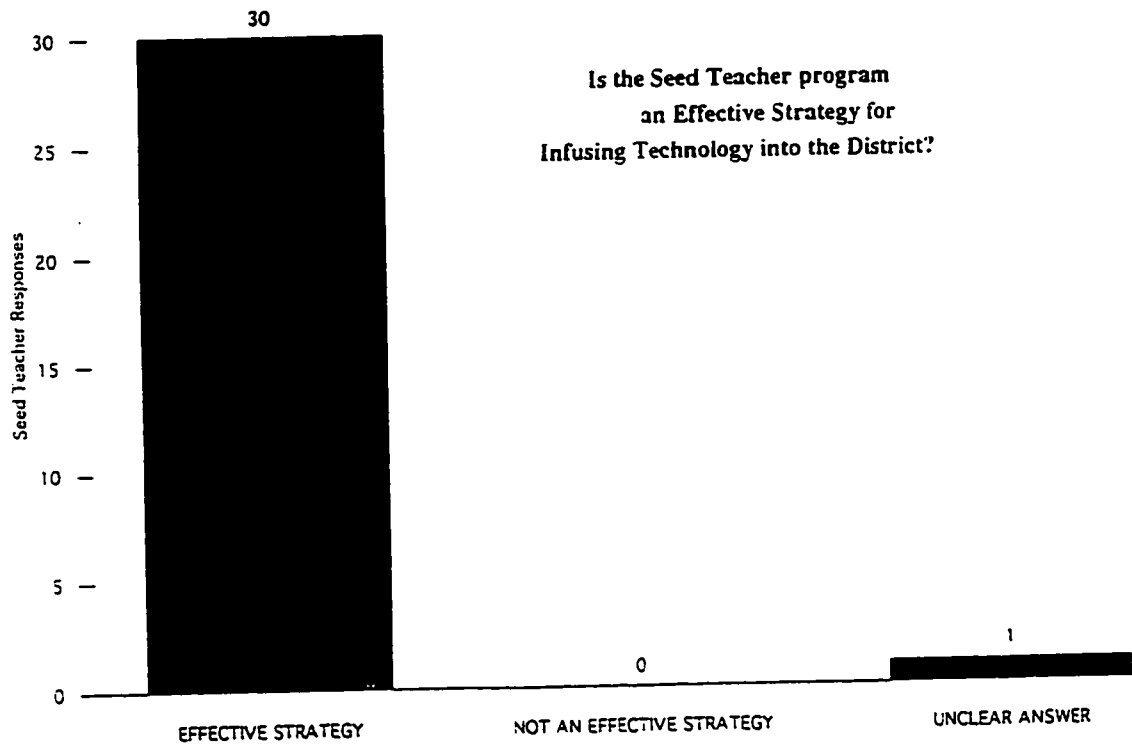


## Drawbacks of Being a Seed Teacher





**Seed Teachers Rate Their Skills Before and Since Being Seed Teachers**



## Appendix D

### Survey Of Building Colleagues and Result Charts

# SEED TEACHER PROGRAM TEACHER SURVEY

As a doctoral student, I am conducting a case study of the Seed Teacher Program as a strategy for infusing technology into schools. I hope you will complete this small survey and assist in this research. I very much appreciate your time and careful attention. Your remarks are confidential, as I will compile the answers and report on them only once they are aggregated. Thank you. Nancy Messmer

*When appropriate, please mark more than one choice, or write your own response.*

School CASCADE PARK Grade level you teach 1st

1. How many Seed teachers and former Seed teachers are there in your school? 8

2. The following activities are conducted by some Seed teachers. Please mark those which have been a benefit to you.

- Troubleshoot on equipment issues and problems
  - Troubleshoot on software issues and problems
  - Teach classes on computer use
  - Teach classes on computer programs (i.e. Works, Excel, Creative Writer)
  - Teach model classes for kids (demonstrate ways to teach with technology)
  - Preview and advise about software
  - Relay information to staff about TIP Project and other district technology issues (like copyright information, upcoming opportunities)
  - Assist with E-Mail issues
  - Keep track of equipment
  - Keep track of software
  - Run and maintain the computer lab
  - Serve on building and district technology committees
  - Coordinate technology issues in the building
  - Act as liason between TIP kids and staff
  - Other (please list)
- 
- 

3. Please circle the 3 activities listed above which are of the most benefit to you.

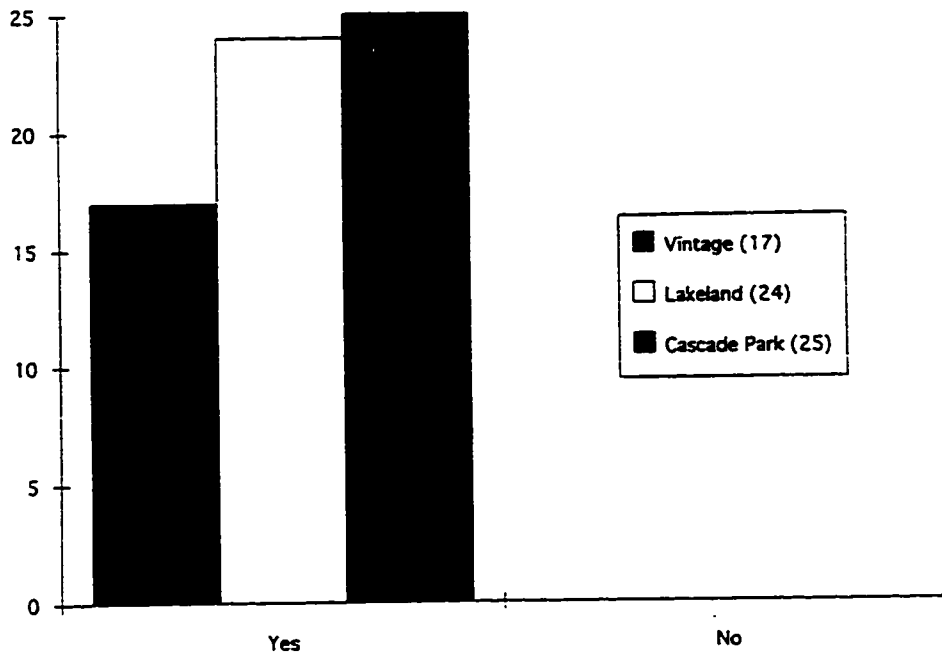
4. Please rate how helpful Seed Teachers have been in the growth of your computer-using skills?

- Very Helpful     Helpful     Somewhat Helpful     Not Helpful

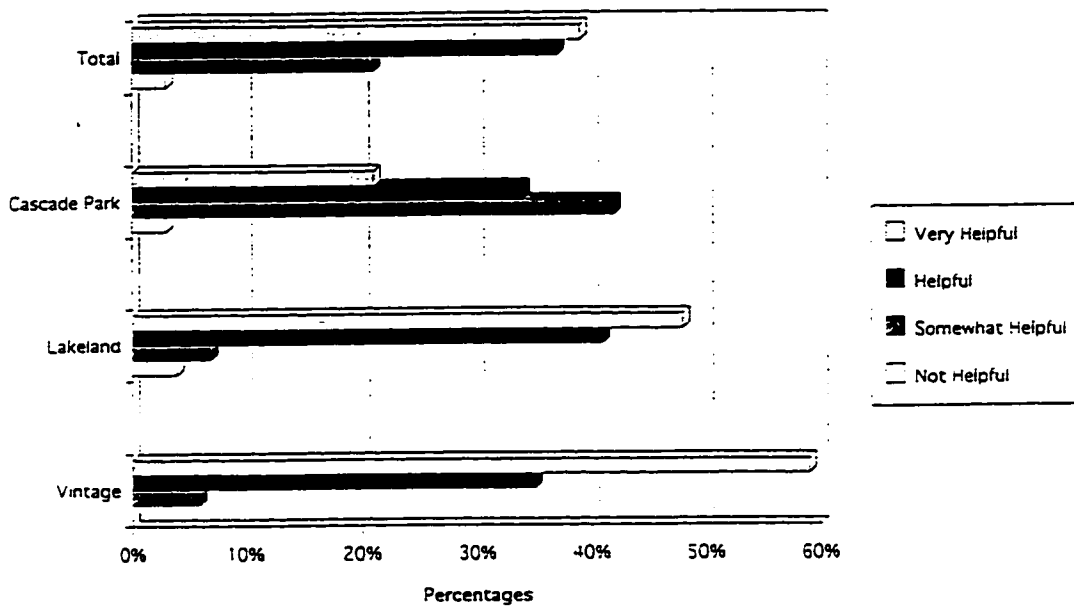
5. Please mark the average number of times per week you ask a current or former Seed Teacher for assistance (including questions, physical assistance, advice, troubleshooting, etc.)
- 0-1       2-3       4-5       6-10       More than 10
6. Would you like to be a Seed teacher?     Yes     No
7. Are you now or have you ever been a Seed Teacher?     Yes     No
8. Should the District continue the Seed teacher program?     Yes     No
9. Is the Seed Teacher Program a benefit to the school?     Yes     No
10. In addition to your teacher workstation, the number of computers in your classroom.
- 1       2       3       4       5
11. Rate your computer-using skills.     Beginning     Intermediate     Expert
12. Estimate the average number of hours per week you use a computer (include school and home use).
- 1 hour or less     1 to 5 hours     5 to 10 hours  
 10 to 15 hours     More than 15 hours
13. Estimate the average number of hours per week a student in your classroom uses a computer at school.
- 1 hour or less     1 to 2 hours     2 to 3 hours  
 3 to 4 hours     4 to 5 hours     5 to 10 hours

*Thank you so much for completing this survey. Please put your survey in the designated envelope and mark your name off of the staff roster.*  
 Nancy Messmer

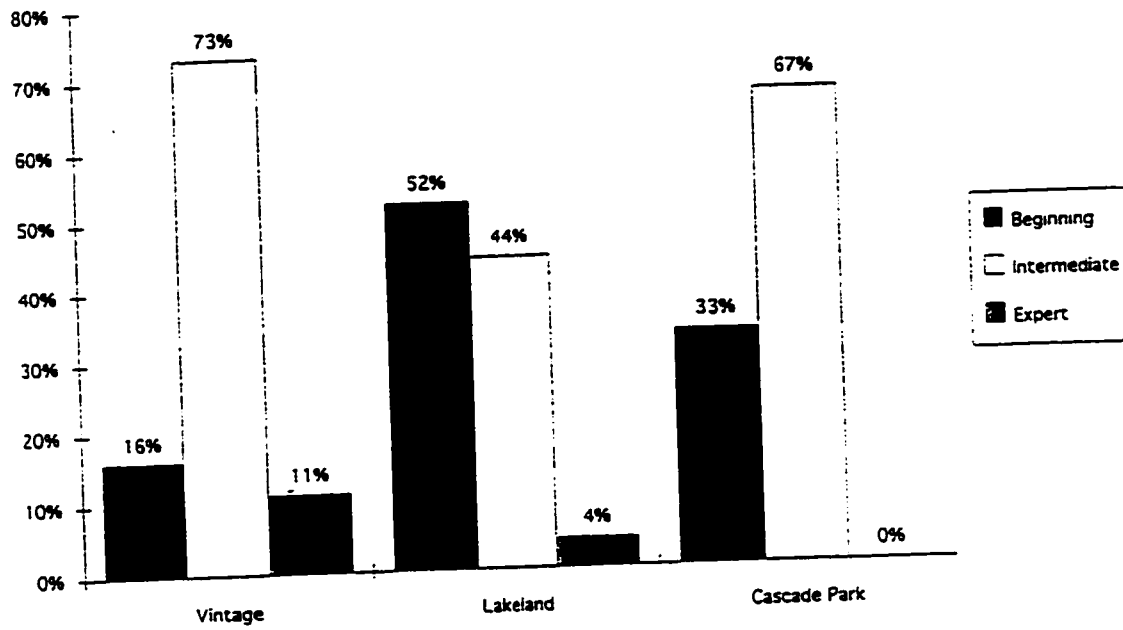
Should The District Continue the Seed Teacher Program?



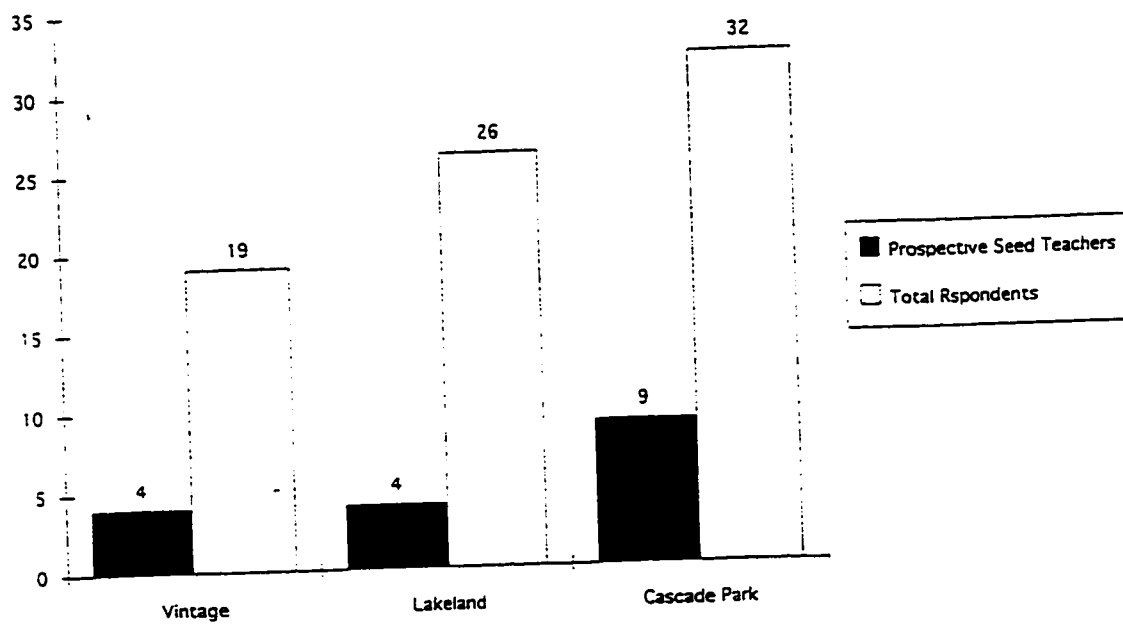
Are Seed Teachers Helpful?



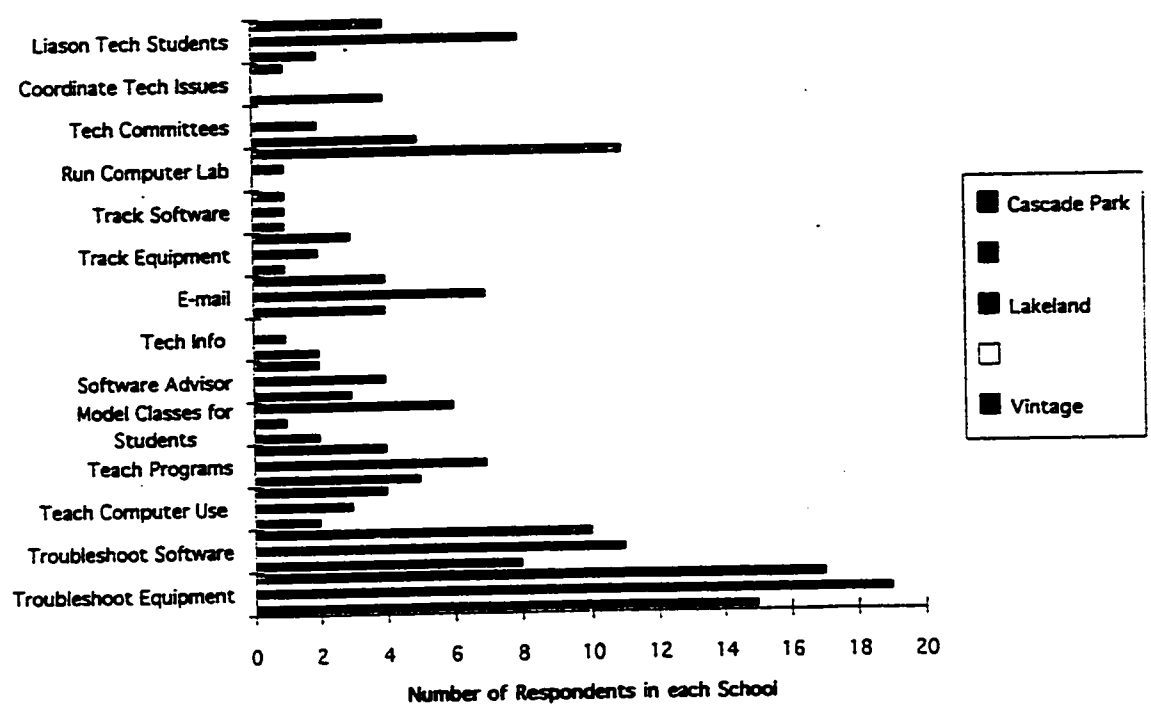
Teachers Rate Computer-using Skill



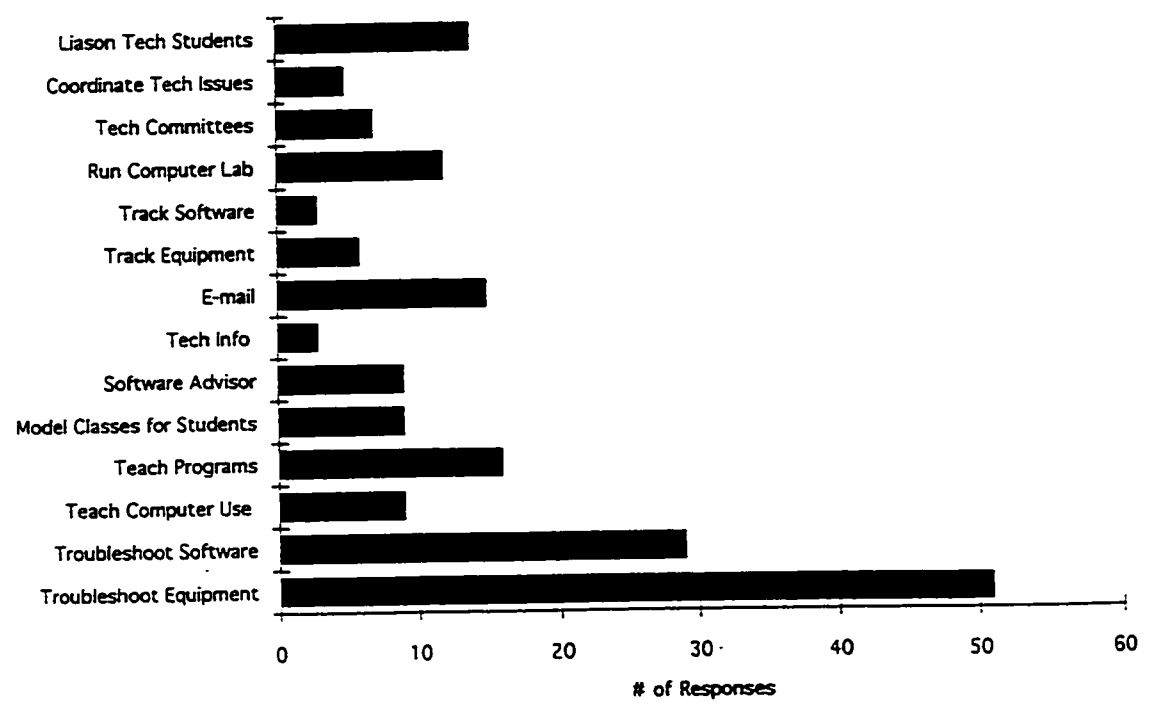
Colleagues Who Want to Be Seed Teacher



Colleagues Name Top Three Beneficial Activities : *By School*



Colleagues Name Top Three Beneficial Activities - *Total*



## Appendix E

### Vista Schools "Student of the Future" Documents

## STUDENT FOR THE FUTURE

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In developing the student for the future, basic skills will be the foundation for tomorrow's curricular and co-curricular program. In addition to these basic skills, an appetite for life-long learning and goal-setting will be cultivated in all students as the following characteristics are developed:

<b>ADAPTABILITY</b>	<i>Understanding how to plan for change and how to work through the change process.</i> Flexibility Tolerance for ambiguity Creativity	Resiliency Resourcefulness Risk-taking
<b>CRITICAL THINKING</b>	<i>Using higher level thinking skills to process and use information.</i> Information acquisition Problem solving skills	Decision making Implementation
<b>COMMUNICATIONS</b>	<i>The ability to interact with and be understood by others in the light of a changing world.</i> Oral, written and visual communications Interpersonal/social skills Teamwork skills	
<b>CHARACTER</b>	<i>A distinguishing combination of emotional, intellectual and moral qualities.</i> Self-discipline Respect for others Joy of living Commitment Humor Moral/ethical development (e.g., issues in biotechnology, media and government)	Self-confidence Courage Leadership Persistence/determination
<b>GLOBAL PERSPECTIVE</b>	<i>The ability to view the world as an integrated community.</i> Valuing cultural diversities and commonalities Understanding interdependence	
<b>CITIZENSHIP</b>	<i>The ability to contribute effectively within a democratic society.</i> Community service Civic participation	Respect for democratic principles Respect for the role of dissent
<b>BALANCE</b>	<i>The stability gained from weighing opposing alternatives and making wise choices.</i> Work/leisure Physical/mental wellness	Cooperation/competition Self-actualization/ relationship-building.
<b>LIFE PLANNING</b>	<i>Preparing the student to successfully take the next step in life.</i>	

With these skills and characteristics, the student for the future will have the foundation for success in personal living, success in the workplace and success as a member of society.

## *Building Connections for the Student for the Future*

<b>The Goal:</b>	Curriculum that is <ul style="list-style-type: none"> <li>• flexible</li> <li>• connected</li> <li>• responsive to change</li> <li>• innovative</li> </ul>	Programs that readily accept differences in <ul style="list-style-type: none"> <li>• materials</li> <li>• time structure</li> <li>• group configurations</li> <li>• instructional strategies</li> </ul>
------------------	--	---

### Our Beliefs about Teaching and Learning

#### Life-Long Learning

Life-long learners must:

- understand how they learn
- experience learning in a variety of ways
- be willing to risk
- make decisions about what and how they learn
- reflect
- evaluate their own learning

#### Active Learning

When active learning is encouraged, teachers

- use a variety of techniques to engage students.
- provide a safe environment that encourages students to risk.
- enlarge the student's capacity to learn in varied styles and situations, and
- encourage students to be engaged with the community.

#### Process and Knowledge

Knowledge of facts, concepts, and principles will be vehicles for

- learning how to learn and
- how to search for meaning.

#### Intelligences and Learning Styles

Designing lessons to include the many ways of learning will assure that all students

- experience their preferred modes and
- develop their varied capacities.

#### Integration of Learning

It is essential to develop links, or meanings, as the body of knowledge increases and its fragmentation accelerates.

Integration can be accomplished by

- integrating ideas within a subject matter and
- integrating across subjects or disciplines.

#### Learning and Teaching Materials

Materials must be abundant, varied, developmentally appropriate, and engaging. They should include primary documents, data bases, telecommunications, laser discs, software, manipulatives, works of art, music, and literature, journals, books, films, and materials and processes not yet imagined.

•Adaptability•Global Perspective•Critical Thinking•Citizenship•Communications•Balance•Character•Life Planning

#### Information Technology

In the future, technology will provide new ways for organizing, teaching, and learning. Students will need to use technology as tools of production as well as for finding and organizing information.

#### Equity and Special Needs

Every student has the right to an equal opportunity for learning experiences that stretch the individual to develop the full range of his or her abilities. All students should have some latitude to choose what and how they will learn.

#### Benchmarks

Benchmarks are

- exit expectations for grade-level spans,
- both concept and process oriented, and
- measurable, although not necessarily by traditional means.

#### Student Progress

Learning is a continuous process. In the future, assessment will be based on crucial learnings and will honor:

- the continuity of learning across subject areas and time
- the variety of ways of learning
- a range of evidence of learning
- individual growth, as opposed to comparison among individuals or groups
- self-direction

#### The Learning / Teaching Environment

The learning and teaching environment will

- be rich in aesthetically appealing and stimulating "hooks" that motivate learning
- provide space for individual and group work
- will accommodate interaction with community members
- will accommodate reflection as well as interaction.

## Appendix F

### Sample Analysis Documents

#### Interview Summary Form

Name Sylvia Date Feb 14, 1994 # 2

Place Sylvia's Home-living room Time evening 2 1/2 hours Type Seed Teacher

#### Questions

1. What are your goals for yourself as Seed Teacher?
2. Do you and your partner work together?
3. How do you think being a Seed Teacher affects your classroom?
4. Has being a Seed Teacher affected your relationships with other teachers?
5. Do you anticipate that being observed and keeping a log will have any effect on your work?
6. What have you done this week in your Seed Teacher role?
7. Since our interview two weeks ago, do you have any new awarenesses about your own or the seed teacher idea?
8. Please think about the Seed Teacher idea and draw a picture and talk to me about it.
9. What do you think it is all about?
10. What are the roles you play as a seed teacher?
11. What needs are intended to be met by the Seed Teacher program?

#### Main Ideas

Her goals for the year are to review software and get better at Ned's electronic report card. She feels like she is going very slowly. She writes for the parent newsletter about tech. issues. She is writing tech goals with the tech committee.

She works on the Apples, but nothing much needs fixing.

She delineates her Seed work from her classroom and feels like there is no impact in the classroom except for added pressure on her.

She went to Rick to quit but he asked her to stay on and said she was doing fine.

She tries to help when asked because she feels obligated. She calls for help from TEK kids. She feels like the two Seeds the previous year were not very technical either and did the job about like she is.

Seed Teachers communicate with staff, coordinate inservice, solve problems or call TEK kids, work on tech committee (real eye-opener), new software, attend conferences. Report back to staff (nobody ever has but I want to.)

People really trust the tech committee and don't want to make difficult decisions themselves.

she is a guide...not an expert. she generates interest and tries not to frustrate teachers.

she loved having the tech specialist and wishes they had him back. She thinks the district is trying to limp along without hiring a specialist per building by having seed teachers

#### Mood/Impressions

Sylvia is down down down on herself. She lives all alone in a lake. She was a gracious hostess and very sure of herself until we started talking about technology. She starts to whimper and whine helplessness

### Document Summary Form

Name TEK Brochure  
 Date no date. about 1992 Author Wes Wright and Joanie Land  
 Type Brochure about TEK to hand to visitors

#### Summary

Gives info about district.

Answers Questions  
 What is TEK?

goal is to create "an electronic village for learning" by

1. providing computer workstations for every teacher
2. insuring computer access for every student, kindergarten through 12th grade
3. creating local and wide area networks that link every TEK machine in the district and facilitating electronic collaboration
4. utilizing the human resources of students, staff and volunteers to develop and oversee the project.

tells history of project and features parent who started the whole thing.

little feature box asks readers to imagine various scenarios in the electronic "classroom" of the future....selecting books from distant libraries, connecting with penpals around the world, doing attendance by computer, and interactive distance learning.

features drawings of TEK computer village featuring any to any communication among desktops and servers

another drawing of What is a School? Industrial and Information Metaphors

narrative features stories of students working with vendors and volunteers to build and maintain the network and names the helpful people and companies.

Describes the 1988 \$2.7 million tech levy and the 1992, \$9 million capital projects levy with \$6 million to continue TEK. Are building a district-wide high speed digital data/voice communication network.

Brochure looks good. Informative.

Eloise	Barry	Cindy
1 job assignment librarian	1 job assignment 5th grade -integrated (spec. and res. ed)	1 job assignment 5th grade
2 years as teacher classroom teacher for four years in another district. I taught grades three and five mostly, although I had some sixth graders thrown in there periodically been a school librarian for four years, all four of those years here, and in between that did some work as a medical librarian. I was going to graduate school and I was raising kids and all that kind of stuff, so it was sort of around the edges. I worked for Children's and for Group Health. And I did some consulting work for the Puget Sound Hospital Library Consortium. degree in elementary education, K-12 music ...from Central. masters in library and information science. UW	2 years as teacher 17 years Aged 4 years	2 years as teacher 25 years
3 years in school and district 4 years at tv parent volunteer in Starside library	3 years in school and district 13 years Mountside prison (ages 10-19) 4 years at Cascade Park	3 years in school and district 16 years at 5 schools, most elementary and some middle school 4 years at Cascade Park
4 seed status former-previous year	4 seed status current - 2nd year	4 seed status former-previous 2 years
5 Why did you become a seed teacher? <i>Doing it anyway</i> <i>2 computers</i> the one question that you had down there that said who has the ability to help me ... how many people, and it was in our building it was often just one ... person. <i>Oh so that's really about you and your partner</i> ... very, it's not so much what the truth is, as what they, their vision of it is. Yeah, and their perception is that there's one to help us, and how I got into it in the first place was because the two people that were doing it were having a rough time and they were coming to me, so I thought, well I might as well get paid for it. (laugh)  I started it because the people that were seed teachers kept coming to me and saying, we think that this is such and so, what do you think? Or, I can't get this to work, will you come and check it. And I was spending a lot of time doing computer stuff anyway and I decided that I might as well get paid for it. So, I did.  <i>From 6</i> <i>transition to another career</i>	5 Why become a seed teacher?  <i>wanted it to push you to learn a little bit</i> Yeah. And it was encouraged and I thought it was a good opportunity for me just to go ahead and jump in and, and do it. Because I knew I probably wouldn't if, or it would take me a long time if I just kind of kept saying, Oh, I'll do it, you know, later. But if I had to do it, if I was under pressure to do it, I would do it. So I did. Being able to get a computer again for home is really a nice, you know, carrot, or whatever you want to call it. It's a good way to get one and get a good machine. 486 Genesis  <i>under pressure</i> <i>computer a carrot</i> <i>push you to learn</i>	5 why become a seed teacher?  I really wanted to learn the computer and that's the only way I learn things, is I take a class in it. I'm ... I guess I'm a self motivator in the sense that I'll take classes. But I'm not a self motivator like I'll sit own and read, read. I'll go to sleep next thing I know. I'll keep nodding off when I'm reading that technical stuff. Well, now, I asked her, I said ... Pauline, do you think ... because no one wanted to volunteer. And I said, do you think I could do it? Meaning, I didn't know if I could do it diddley. And, oh, it's kind of funny. Uh, my classes had won for three years ... either it was three or four ... they won four computers, my classes, from the big company. And, I'll tell you, it's just sort of ... I knew absolutely nothing and Pauline ... I'm digressing here, but Pauline needed a person that would be the seed teacher. And I just knew nothing. But I have always had the ability ... real good kind of classroom control and rapport, and I knew that I could teach my fifth graders how to boot these puppies up in the morning.  <i>wanted to learn</i> <i>take classes</i> <i>could show kids lots</i>

How Would You Infuse Technology Into Schools?	
Grace	Series of goals or stepping stones. Long and short range. Keep Seeds and figure out a way to keep old Seeds involved.
Jack	Be very authoritarian. Adopt district-wide things. Mandate programs. Have district-wide inservice sessions. Apart from Seeds instructing here and there, do real good in-depth job of inservice. Do continual inservicing. Some type of district software review committee in place to recommend but not mandate. Didn't like Logowriter being mandated. Hire tech specialist. on the other hand we always resent specialists and wonder if they are earning their pay. Maybe hire classified staff or more TEK kids.
Ned	Use Tech tools to teach. Students and teachers create curriculum and press onto CD-ROM. No more prepared curriculum purchases. Keep Seeds...one-to-one training model engrosses people. most efficient. People in Vista have lost the essence...need to redefine. Essence is risk-taking. Start small. Perpetuate good ideas informally, like Seed and TEK.
Sylvia	loved having tech specialist. can't ever pay somebody enough money for amount of stress or time it takes when you have a full-time job. Use TEK kids more. I just don't know what way to go, I don't even want to look at hiring a specialist. each program ...experts in our school have been Seed teachers. Gotten an interest through it or learned through it. Not just 1 or 2 experts in bldg. we have quite a few now.
Eloise	Keep Seed Teacher program. Hire network managers, probably former Seeds. Eloise would like to do it.
Cindy	Start with a really good computer lab. Teacher and class come to lab to learn. Hire good lab teacher..no seniority..need master teacher. I'm that kind of learner, I need everything starting from A all the way down, black and white. Have it written up, programmed up, study in evening. Have notes or teacher references for the teacher. After a year, they can bring kids on their own.
Barry	A select few...they go to schools and help set up what the school wants. Be consistent, one to a school over time or a team comes and gets everybody up and then moves on. It would take a long time. Use machines, understand the programs. Know what is available. How to use the internet. Do in cadres or in regular after-school sessions. All would have to commit. Make sure the teachers have classroom experience. extremely computer literate with classroom experience to back them up. If I wasn't a Seed, i'd be dragging my feet.  Seed a good way of gathering and spreading info. get people involved.  love having a partner. having one person won't fulfill our dream.

### WHAT ARE YOUR DUTIES AS A SEED TEACHER?

I listened with this question to see if this position of seed teacher is perceived as a cut-and-dried job with clear expectations or whether there was flux in it. Also, did it evolve over time and is it operated differently from building to building?

Troubleshooting hardware problems has always been part of the job. In the first few years, seed teachers were expected to teach model lessons with classrooms of children and their teachers. This was a controversial expectation. Jack reports that he actually developed high blood pressure in response to this requirement and was ordered by his doctor to quit, which he did not. He only took the job for a second time when he clarified that he would not be expected to teach in front of his peers. Since the job was cooked up to get training into schools, there is always an expectation that seed teachers will do something to help their fellow teachers.

Eloise, Barry and Grace start off a description of their duties as primarily troubleshooting the computer problems of others. Eloise said, "whenever something crashes or won't work or the printer won't print or whatever, it's my job to figure out why, if I can. I would say that's my biggest one, is the troubleshooter, trying to solve the problems before we haul in the big guns." Barry says her duties are "making sure to answer people's questions. If I can't answer them, to make sure that they get forwarded....make sure that people are happy and that if people have questions in the lab that they are answered." Cindy says, "if a teacher needed help, we'd go and we'd help...try our best to help the person. I would call, like Jerry Joseph or Donald<sup>to</sup> or somebody that could help me, teach me....and then I would go and help them. I'd try to problem solve and then go in and help them." Grace describes the situation at Lakeland, "Jack and I have split it up that I will do the getting peoples' computers working, getting them back working, solving their problems of why the printer doesn't print type of thing, because I have time to run around."

Of the three schools, Cascade Park is the only one with a lab. The seed teachers run the lab. This is a common expectation across the district in elementary schools that have computer labs, such as Endeavor, Starside, and Denman. Cindy said "We'd turn on the lab every morning, we bought the software, we actually ordered the machines, we made sure every day that the lab was in running order. The kids were just trashing, trashing...and that was all I was doing, was making sure everything was on. We bought the *At Ease* program and got that nice and locked up. So that works really well." When Cindy was a Seed Teacher with Eloise, her fifth graders got the Commodore lab set up each morning and were the troubleshooters for the machines. Cindy pushed to have computers for a Mac lab and took primary responsibility for maintaining it. She taught Barry what to do. Barry says she "makes sure that the lab is up and running and that periodically things are cleaned off. We have many filthy words put on these machines.. With the *At Ease* program, its real hard to get them off. Its real interesting, so its a whole new form of graffiti that the kids have discovered. I don't know why it's so shocking, but it is."

Eloise saw that she had three primary duties, troubleshooting, working as "a trainer of staff," and "keeping track of where the equipment is and who's got it." She set up a little mini-lab with computers donated from classrooms and conducted after-school inservice sessions on Mondays and Wednesdays for three months. She and the other Cascade Park seed teachers, Cindy and Barry, describe this as an important event in the technology development of the school. Cindy and Barry both measured themselves against the mini-lab sessions conducted by Eloise. Eloise was never quite sure where the line was between her responsibilities as a library media specialist and a seed teacher in a building acquiring more and more technologies. This uncertainty was one of the reasons she liked being a seed teacher.

At Cascade Park, Eloise said that the seed teachers formed the committee that made technology decisions for the building. Although she now believes this should be a bigger committee, she said "it's a scary thing, but up until now that has been the policy, that the seed teachers know what to do and so they listen to what people want, but they make the decisions on what to buy. They spend the bucks." This made her nervous when she did it and it makes her nervous now. She tells what can happen. "We made the decision to put screen savers on. When we first got those Macintoshes, everybody was squawking and screaming to the mountains that you'd better get screen savers on those computers, so that the monitors didn't get etched. And so Sharon Cullow and I just freaked and went out and got enough screen savers so that there was one for everyone in the building. Almost the day that we had installed them, Frank came by and said, 'Gosh, you know you really don't need those with color monitors.' We were very angry. Because we had been lead down the primrose path and really hadn't had anybody to talk to about it. We didn't even think to contact Frank. What did he know about software, you know. That was an interesting case in point, where nobody on the staff was in place in a committee. The administration knew less than we did. And the teachers didn't want to know. They just said, do it. It's important, you take care of it. We don't have time. So we did. And it was a bad move."

Jack and Grace felt like they should be on their building technology committee, as did their principal, Susan. Neither was willing to meet at night, however, and that is when most of the meetings were scheduled. They come when they can.

Sylvia did sit on the technology committee at Vintage, with the principal, a parent, and several teachers, mostly former seed teachers.

Sylvia is the most unclear about the duties of the job, "it's pretty loose.....you're supposed to trouble shoot things that go wrong with the hardware and try to fix those before you get somebody from the District to do it." She lists ~~the~~ rest of the duties as the expectations about conferences, release days, and meetings. In describing her role, Sylvia sees herself "more of a guide, I would think. I don't see myself as an expert. Maybe to generate interest, and expose teachers to what's out there, without frustrating them too much. Because they don't have time to do it on their own, and then to have empathy, to develop an atmosphere in the school where it's not a we and a them, but it's all kind of us together that you might learn slowly, it's OK to learn slowly. So I guess a non-threatening role, just kind of sneak it in on people and make it kind of fun or something, but yet get people interested. so, anyway, non-threatening role but yet get people interested. be looking at the computerized report card and keep revising it. a role as a seed teacher would be to inform parents, which is what I'm doing this year, about what's going on in technology in the school. maybe one thing that as a seed teacher we might be wanting to draw in more parents."

Jack describes his half of the seed teacher job with Grace as "I do the inservice on the programs." However a description of his activities each week reveals that he helps teachers a lot with their machines.

The seed teachers seem to spend most of their time on troubleshooting. As the buildings acquire more and more computers, their time is more in demand.

	ELOISE	BARRY	CINDY	SYLVIA	NED	JACK	GRACE
<b>FIXED HARDWARE</b>	laser disk connected to mac 92 missing piece, vendors  fixed printer-install printer drivers	done a lot of trouble-shooting		worried w/least to figure out how to turn on S20, read manual, kid figured out that you press keyboard  how to get disk out w/o power, success  know how to connect pins for scsi cables  hook apple IIc to tv, figured it out.	based on supplemental contract, acts as trouble-shooter whenever he leaves the room.	reboot systems after a crash. Tech kid did it in 10 min. Jack considers it an achievement  figured out how to take mice apart and clean and fix  troubleshooting, going to people's rooms. Linda's screen blank, turned on monitor. She was glad it was Jack because Grace never would have let her here the end of it.  PC viewer, which monitors work and don't.	split job w/Jack. She trouble-shoots. Before and after school, lunch, prep class.  get everybody up and running and solve their problems  teachers ask me questions at lunch.  have a clip board where they write problems, they e-mail me or voice mail or note in my box, about 1/3 of each way.  helping different people with their computer problems
<b>SOLVED SOFTWARE PROBLEM</b>	put on scsi drivers	take off dirty words	Put on word program installed all software	went to all classrooms w/Merry, took off SAM and put on another disinfector & changed all names on e-mail every one was different	designed electronic report card, assists.	show one teacher how to format  figure out database in works  put on easy share	checked - same share on Commodore & working
<b>GAVE ONE-TO-ONE LESSON</b>				wrote w/ Jill - Sam on report card	helps each teacher customize the report card.	worried with teacher to make a database, several nights, had to learn it with her  taught office staff to do envelope on ibm, they were amazed.	I like teaching one-on-one when I can come on a Sunday and I'll show you how to do this...but when the teachers are still trying to work on covering a title...  take teachers through programs, five minutes here and five minutes there
<b>TAUGHT INSERVICE SESSION</b>	mini lab 3 months lessons		taught class in mini-lab		as asst, conducted lessons on commodores	in-service on making banners using Creative Writer, had 2 and 3 people	
<b>PERSONAL LEARNING</b>	get modems to work at home, hook to W/SIPC, use library from home and school	use DOS each at home get extra data to work make computer power	learning Personal Press bought digital camera learning the Tools  hooking up modem at home, use Prodigy	figured out how to do ditroica mail for self, and helped. found myself to get shield of Lila.	trying to push file maker pro, don't get work for neighboring district, middle school and high school.	checked about Grace and Mack contacting friend by e-mail.  signed up on listserves, no response  figuring out network  country library, addresses from whole country	working on Internet, trying to figure out how to get anywhere on it when I get a chance.  want to work with Powerpost. Watch Merry present with it after learning it on Friday. Imagine how I would use it.
<b>ATTENDED MEETING OR CONFERENCE OR CLASS</b>	internet training is great, downloaded files from ERIC, learned DOS stuff	conference interesting, overwhelming, know there is a lot we will never touch went to 2 sessions on Jurassic Park.  Shelley & I drove, planned next year.	took internet class took classes from Jerry and Ace  Went to learn in classes	took word class other classes my class in summer  frustrated w/word meeting, couldn't get connected right for internet, list made her think she cannot do anything  sent mtg. Ace showed logowner, no time to practice		didn't go to conference in Eastland, would not pay for lodging, tried to find someone to go in his place, very worried, asked many people, concerned that it would reflect badly on his school.  took my class for whole year	Conference. Learned the most from Vista staff. Better use of money to meet here and not go away. try to use some of the information I did pick up.  took Powerpoint class, Todd late, it is interesting.
<b>TEACH CHILDREN</b>	give 5th graders programs to set up commodore lab	get individual kids on machine to play Oregon Trail and work on Works  Kid doing lesson plan to teach other kids  Architecture	wrote a letter showing techniques in lab for 1 hour a day, 2 5th grades, keyboarding mostly, free exploring on Fridays	kids type stories with helpers  program mapplet state for each  scheduled computer time for 1st graders	students use computers in class and library as part of learning projects. Scanner, photoshop, pagemaker.	set up commodores across back wall, programmed in spelling, language and math for kids, teaching them to program.  show edron programs w/roc	teach kids to do e-mail  want to start a helper group of kids

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**PERSONAL DATA** Birthdate: July 6, 1949 Birthplace: Seattle, WA.

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**EDUCATION**

- 1996 Doctor of Philosophy. School of Education  
University of Washington; Seattle, WA.
- 1988-1989 Graduate Studies in Computer Technologies and Library Media  
University of Washington; Seattle, WA.  
University of Oregon; Eugene, OR.
- 1984-1985 Graduate Studies in Staff Development and School Improvement  
Staff Development Institute at University of Oregon; Eugene, OR.
- 1981 Graduate Studies in Experiential Education and Models of Teaching  
Lewis and Clark University; Portland, OR.
- 1979 Graduate Studies: Elementary School Certification  
Webster College; St. Louis, MO.
- 1976-1978 Graduate Studies in Alternative, Experiential and Environmental Education  
Washington University & Webster College; St. Louis, MO.  
George Williams College; Chicago, IL.
- 1975 Master of Science Degree. Secondary Education: Alternative Schools  
Program. Indiana University; Bloomington, IN.
- 1971 Bachelor of Arts Degree. Sociology. Cum Laude  
University of Washington; Seattle, WA.
- 1967 High School Diploma. With Honors  
Seoul American High School; Seoul, Korea.
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**PROFESSIONAL EXPERIENCE IN EDUCATION**

- 1990-Present ISSAQUAH PUBLIC SCHOOLS, Issaquah WA.  
Instructional Technology Specialist and Library Media Specialist
- 1990-Present SEATTLE PACIFIC UNIVERSITY, Seattle, WA.  
Adjunct Faculty. Courses in Computer Technologies, Learning Strategies

- 1990-1990 WHITE RIVER, ENUMCLAW & SUMNER PUBLIC SCHOOLS, WA,  
Planning Director for Alternative High School
- 1986-1990 CAPE FLATTERY SCHOOLS, Neah Bay, WA.  
Neah Bay K-12. Library Media Specialist. 1987-1990  
Neah Bay Elementary. Classroom Teacher: Grades 4-5. 1986-87
- 1981-1986 EVERGREEN ALTERNATIVE LEARNING CENTER, Vancouver, WA.  
High school Teacher/Advisor
- 1979-1981 PUBLIC SCHOOLS, Seattle, Bellevue, Lake Washington, Issaquah.  
Substitute Teacher K-12
- 1978-1979 THE COLLEGE SCHOOL, St. Louis, MO.  
Elementary Team Teacher/Intern
- 1975-1978 CLAYTON ALTERNATIVE SCHOOL, St. Louis, MO.  
Teacher/Coordinator
- 1972-1975 TRI-CITY YOUTH SERVICES, Wisconsin Rapids, WI.  
New Ways Learning Center  
Curriculum Coordinator/Teacher/Counselor 1974-75  
Vista Volunteer/Youth Outreach 1972-74
- 1968 SEOUL YOUTH CENTER, Yongsan Army Post, Seoul, Korea  
Assistant Director

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ABLE EDUCATORS. Consulting and Inservice on Computer Technologies, Alternative School Design, Staff Development, Cooperative Learning, Learning Styles, and Learning Strategies. 1990-Present

WASHINGTON ASSOCIATION OF LEARNING ALTERNATIVES  
President 1987. Long-standing State Board Member..  
Annual Presentations at State Meetings

NATIONAL ALTERNATIVE SCHOOLS CONFERENCE  
Conference Co-Chair. 1987. Port Townsend, WA.

METROPOLITAN ST. LOUIS COUNCIL ON ALTERNATIVE EDUCATION  
1976. Organizer/convener