This volume is a collection of studies examining the key role of the teacher in the process of school change when innovative pedagogical practices and better ways to develop the school are being sought. Teachers’ work in a changing school culture is a central source of strength in establishing the new practices in ordinary school life. Teachers are generally understood to be crucial for successful change in the school, for the long-term development of their professionalism, and for the advancement of the school’s socio-cultural processes.

The aim of this book is to outline the complex character of teachers’ work in schools and their communities. Teachers’ work is observed here in the light of research presenting innovative approaches and reforms. This book is divided into three parts. The first part focuses on contexts for transformation in teachers’ work, the second on an examination of case studies documenting the changing nature of teachers’ work, and the third on comparison of the trends and issues previously presented. The chapters in this volume discuss prospects of teachers’ work in the United States and Europe, as well as in China, India, and Japan.
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It is indeed an honor to write a foreword to this volume edited by Eija Kimonen and Raimo Nevalainen, both of whom I have known for several years. During this time, I have been impressed by the scope of their interests and their commitment, both intellectual and methodological, to their research on teachers’ work. Underpinning all the chapters appearing in this volume is a consensus about the methods to be employed, but more importantly, a social-cognitive constructivist understanding of educational practice. Thus, understanding teacher professional development is inseparably linked to effective educational and curriculum reform.

Furthermore, the chapters in the volume reveal the comparative orientation of the editors, as there are many lessons to be learned from the diversity of learning environments and the manner in which educational systems the world over are responding to curriculum and pedagogic reform to cope with the needs of the times. The chapters explore the process of educational reform and teachers’ work in distinct cultural and national contexts, extending from Finland, to England, China, Japan, and the United States. I appreciate the significance of the fact that this volume is dedicated to India as well, since three chapters of this volume describe approaches to education there. This brings us to another interesting feature of this research project; the fact that the case-study schools chosen by the investigators are by and large rural schools, where the implementation of pedagogic reform can be rather slow, especially in an Indian context.

The underlying premise is that teacher competence, as a concept, indexes the ability to analyze changes in the social and educational environment in order to reform and/or modify teaching practices. In fact, as the editors of the volume inform us, a recent but central preoccupation with educational studies has been to understand how processes of educational innovation, changing contexts, and teacher professionalism can combine to enhance pedagogical and professional competence. The chapters in the volume go a long way in explicating the manner in which these two types of competence facilitate the processes of change within the school environment.

The title of the book is truly evocative of the spirit of the work, for the different studies in their own way gesture towards the transformation of the role of the teacher and the enhancement of the quality of teacher professionalism as the sine qua non...
for the enrichment of educational quality and effectiveness. I was veritably struck by Chapter 7 dealing with rural schools in China and the findings of the study undertaken in 2002 by Caroline Dyer and her colleagues in *Democratising Teacher Education Research in India* (see Dyer & Choksi with Awasty, Iyer, Moyade, Nigam, & Purohit, 2002). Nevertheless, the in-depth analysis of curriculum reform in primary schools in China discloses both the strengths and weaknesses of normative frameworks and requires reflection on some minimalist notion of normativity that educational researchers need to work with when researching educational programs and systems from quite diverse cultural and national contexts.

Finally, I would like to remark on two notable features of this volume. On the one hand the chapters highlight the interplay between the internal and external elements that act as determinants significantly influencing the success of the school. Amongst the internal elements particularly noteworthy is the importance of collaborative teams of researchers who work towards the development of an excellent curriculum that recognizes the distinction between curriculum and instructional materials; and the imperative need for sustaining teacher teams and individual teachers’ initiatives since these go a long way in reinforcing teacher professionalism. On the external side the chapters forcefully highlight the role of the community in providing a unique and stable identity for the school and teachers by maintaining the school at the center of the culture of the town or village. Secondly, the book reviews the different social constructivist perspectives of educational practice and discusses the methods employed in the study and similar studies that need to be undertaken. In this case, the book opens itself to a readership of both researchers and teachers oriented to reflexively examining their own teaching contexts. This is one of the several virtues of the volume and the editors and contributors are to be commended for their effort.

**REFERENCE**

This volume is a collection of studies examining the key role of the teacher in the process of school change when innovative pedagogical practices and better ways to develop the school are being sought. The work done by teachers in a changing school culture is a central source of strength in establishing the new practices in ordinary school life.

Teachers are generally understood to be crucial for successful change in the school, for the long-term development of their professionalism, and for the advancement of the school’s socio-cultural processes. Hargreaves and Fullan (2012) stressed that the quality of teaching is captured in the professional capital of those teachers who are “talented, committed and collegial, thoughtful and wise. Their moral purpose is expressed in their relentless, expert-driven pursuit of serving their students and their communities, and in learning, always learning, how to do that better” (p. 5).

This book suggests that the essential professional responsibility of the teacher is to create learning environments in which teaching and educating are linked to real-life situations. This allows learning to be connected with student’s life, experiences, and practical problems. According to this view, solving problems requires an understanding and conscious perception of the whole, something attainable through activity. Combining activeness and a holistic view allows a level of action to be achieved that is not a repetition of previous skills and knowledge, but rather an ability to function in new situations. For this reason acquired knowledge helps students to come to terms with an increasingly extensive and complex reality.

Botkin, Elmandjra, and Malitza (1979) noted in their report No Limits to Learning that traditional, maintenance learning should be replaced by learning that is both innovative and societal. Several of the chapters in the present volume demonstrate how teachers around the world have tried to connect learning with nature, production, culture, or other aspects of society whenever appropriate. The authors of this book share the view that innovative teachers should create a school culture that lays stress on the autonomous control of learning, encourages flexibility, and develops interactivity.
both in the school and between the school and the surrounding community. In this manner ideal learning is linked to its natural context, instruction being active, problem-oriented, holistic, and life-centered.

OVERVIEW

The purpose of this book is to outline the complex character of teachers’ work in schools and their communities. Teachers’ work is observed here in the light of research findings regarding innovative approaches and reforms. This book is divided into three parts. The first part focuses on contexts for transformation in teachers’ work, the second on an examination of case studies documenting the changing nature of teachers’ work, and the third on comparison of the trends and issues previously presented. The chapters in this volume discuss prospects of teachers’ work in the United States and Europe, as well as in China, India, and Japan.

Part One examines teachers’ work in the context of the collegial support of professional development and the enrichment of learning environments. An understanding of the following topics regarding the aims, methods, and learning situations, and their guiding values is one of the central elements in teachers’ work. The first chapter, Supporting Teachers’ Work: Insights from a Study of Differentially Improving Schools in the United States, by La Tefy Schoen, analyzes teachers’ work from the perspective of the social constructivist concept of learning. This chapter focuses on learning environments and aspects of the culture that likely impact the work of teachers within the school context. A central theme is the question of how to support the work of teachers as part of school reculturing. It appears here that learning environments in the improving schools are much more likely to utilize authentic learning strategies. In these schools such a factor is also linked with the organizational culture of the school and student achievement. This is a strong support for cognitive constructivist theories of learning over traditional behaviorist or teacher-centered instructional methods. The chapter is based on a 15-month study of school culture conducted at six matched schools in the United States.

Chapter 2, Extending Teachers’ Work to Outdoor Learning Environments: Applying High-Quality Instruction for Meaningful Learning, by Elizabeth L. Hammerman and Donald R. Hammerman, reveals the importance of primary experience in learning and its environments. The authors focus on outdoor education as it applies to teachers’ work, particularly emphasizing the use of the outdoor environment as an approach allowing better learning of concepts, skills, and dispositions relating to the goals and objectives of the school curriculum. After a brief overview of the history and evolution of outdoor education in the United States, it analytically compares the distinctive features of teacher-centered instruction as opposed to student-centered instruction. This serves as the basis for a model for high-quality instruction incorporating outdoor education as a means for creating meaningful learning and extending teachers’ work to non-traditional settings. This chapter is based on the extensive research on the
historical basis and pedagogical methods of outdoor education in the United States
done by the authors.

Chapter 3, Changing Aims and Values of Outdoor-Oriented Education: Ideals for Teachers’ Work from the American and Indian Experience, by Eija Kimonen, discusses
the results of her research on outdoor-oriented education in two socially different
countries: India and the United States. She concentrates on the interplay between
changes in educational policy and society in the two countries during the 20th century,
and on how this interplay has been reflected as various aims of outdoor-oriented
education. Her conclusion is that the variation observed in the patterns of emphasis
on the sub-components constituting the aims of outdoor-oriented education in the
two countries is connected with the manner in which these patterns influence and are
influenced by social, economic, and political factors. This is interpreted as being a
dialectical process linked to changes in the differing degrees and types of emphasis
placed on central social value dimensions at different stages of societal evolution.

Chapter 4, Teacher Professional Orientations and Competences in a School and
Community Context: Social Participation in the Process of Community Education,
by Raimo Nevalainen and Eija Kimonen, concentrates on Finnish rural teachers’
social participation in the community education process as well as on the professional
competences needed in this process. The study also provides information on approaches
used in community education and their application to teaching. It draws attention to the
importance of career-long continuing education, particularly for teachers working in
remote rural schools and having few opportunities for contacts with other members of
their profession. This chapter presents parts of a larger study of comparative education
research project devoted to an examination of teacher profession.

In Part Two, teachers’ work is studied on the basis of data provided by a unique
collection of qualitative case studies of small schools in Finland, the United States,
and China. The section begins with a chapter by Raimo Nevalainen and Eija Kimonen
entitled The Teacher as an Implementer of Curriculum Change: A Case-Study
Analysis of Small Rural Schools in Finland. Here the authors examine the process of
curriculum change as seen in two small schools in Finland. They analyze the effect
of the changes on curriculum policies and pedagogical practices. The examination
also used previously published empirical research. The present results suggest that
curricula are based on certain philosophies and beliefs about education that shape
teacher’s actions. Therefore, curricular changes involve transformations in teacher
beliefs and depend upon teacher’s readiness to cooperate and experiment. This chapter
utilizes parts of three comparative research projects that have been conducted at the
University of Jyväskylä in Finland.

In Chapter 6, Teacher Perspectives on Reform in a Small, Rural American School
of Historically Finnish Culture: Cultural Transformations, Thomas L. Alsbury and
Karen T. Jackson describe the key factors supporting and challenging successful
school reform in a small rural school in the United States. They report the findings of
a case study conducted at a single K–12 school. It covers 16 years of reform history
resulting in sustained excellence in student achievement. The key factors, either
supporting or challenging the reform, are reported from the perspective of members of the elementary and middle school-level teaching staff involved in the beginning years of the reform effort and who continue to teach or do administrative work at the school. An additional notable feature of the case study is the historically Finnish culture of the local community and school.

The findings reported in the last chapter of this part, *The Challenges of Basic Education Curriculum Change in Rural Primary Schools in West China*, by Shuo Liu, Ruifeng Cui, and Genshu Lu, form part of a research project Learning by Doing organized in Pucheng County, West China. This chapter examines the process of curriculum change as seen in two rural schools. The authors show here that the process of modernizing Chinese society, particularly in its impoverished rural areas, has led to the realization that the most effective way of breaking the cycle of poverty is to provide students with the tools they will need to be able to think on their own. These tools will enable them to identify and figure out resolutions to problems by themselves, with the teacher serving as a partner in information creation rather than as an authority functioning solely as an intergenerational transmitter of knowledge.

Part Three contains comparative reflections on teachers’ work in the context of philosophical currents, orientations to teacher professionalism, the development of teacher education, and a fundamental change of socialization environments. Part Three begins with a chapter looking at the foundations of teachers’ work in a changing social context of the United States and India. Chapter 8, *Philosophical Perspectives for Teachers’ Work: Focusing on American and Indian Outdoor-Oriented Education with International Connections*, by Eija Kimonen, is devoted to some basic philosophical views for the work of teachers. It attempts to identify the essence of the developmental trends in the history of ideas in the field of education, using data from socially different countries. The examination concentrates on the philosophical background of outdoor-oriented education, most specifically in the United States and India. Additionally, it attempts to identify possible philosophical connections between this form of education in those two countries, the early Soviet Union, and revolutionary China. The study is based on a research project that examines the interrelationship between education and society during the 20th century. This chapter continues to focus on the issues introduced in Chapters 2 and 3.

Chapter 9, *Teacher Competences in a Changing School Culture: A Comparative Analysis of Teacher Professionalism in England and Finland*, by Raimo Nevalainen and Eija Kimonen, is a qualitative study examining the teacher’s pedagogical and dispositional competences. The findings reported here form a part of a comparative research project investigating teacher professionalism in England and Finland presented in Chapter 4. The results indicate that pedagogical competence includes skills and knowledge that can be part of the pre-active, interactive, and post-active phases of teaching. Dispositional competences represent the teacher’s qualifications for professional practice and for action as a member of a working community. The authors conclude that teachers must commit themselves to lifelong learning and form their own theory-in-use. The competence to reflect on and study their professional
practice also enables teachers to participate in developing collaborative school culture.

In Chapter 10, *The Reform and Development of Teacher Education in China and Japan in an Era of Social Changes: Trends and Issues*, Congman Rao presents a comparative study of how teacher education is being transformed in China and Japan. It focuses on the similarities and differences that have marked the reform and development of teacher education during the past three decades. The author concludes that a common feature of the reform of teacher education in both societies is a desire to upgrade the social and professional status of teachers. Society should see teachers as true professionals with careers based on lifelong learning. Profound change means that teachers can not continue with traditional ways of teaching – they must absorb knowledge from the latest educational research in order to develop their professionalism. This chapter presents parts of a comparative research project on teacher education in China and Japan.

In the final chapter, *Teachers’ Work and Changing Socialization Environments: Pedagogical Procedures of Outdoor-Oriented Education in the United States and India*, Eija Kimonen discusses the pedagogical procedures of outdoor-oriented education in the United States and India throughout the course of the past century. She interprets outdoor-oriented education as being the pedagogical processes taking place in settings intimately linked with out-of-school reality, concerning subject matter about the reality outside the school, and preparing students for dealing with this reality. The most significant function of this process is to articulate, internalize, and change the essence of reality. The study applies the historico-hermeneutical approach to comparative education, and it follows the developmental trends of educational policy within a social context in the light of the social, economic, and political factors that define national identity. This chapter is based on the research project on outdoor-oriented education dealt with in Chapters 3 and 8.

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REFERENCES


PART ONE

ENHANCING
TRANSFORMATION IN
TEACHERS’ WORK
1. SUPPORTING TEACHERS’ WORK

Insights from a Study of Differentially Improving Schools in the United States

INTRODUCTION

Why are some schools more successful at improving student achievement than others? In trying to gain a better understanding of the myriad of factors within schools that impact student learning, I took an organizational perspective and looked closely at the culture of the school. Many researchers in recent years have begun to attribute variations in school processes to the effects of the organizational culture of the school. It has been suggested that social dynamics within a given school setting impact the way school staff perform their work, accounting for variations in effectiveness. This chapter describes a study conducted in the southern U.S., designed to document and compare variations in the organizational culture of matched schools. While the study itself examined the entirety of school culture, this chapter will focus on learning environments and aspects of the culture that likely impact the work of teachers within the school context. This approach to teacher effectiveness is known as the socio-cultural perspective. This socio-cultural perspective contrasts with traditional behavioral perspectives because it is more concerned with the social and cultural conditions that generate and maintain behavior, than with the behavior itself. The premise of the chapter is that social and cultural conditions present at the school-level influence the learning environments in classes and that, in order to improve student learning, one should improve the quality of the learning environments; this is best done by reculturing various aspects of school operations to better support the work of teachers. The remainder of the chapter will discuss a study built on the following assumptions:

- The socio-cultural characteristics of the school context impact the work-related behaviors of the teachers, who, in turn, impact the quality of the classroom learning environments.
- Mean scores on standardized achievement tests issued by the state and aggregated at the school level are valid indicators of student achievement.
- School improvement status can be determined by tracking a school’s index score (based on student test scores) over a period of two years.
- School culture exists; therefore, it can be measured or documented in some way.
Each individual school has its own distinct culture. Variations in the quality of the learning environment and the learning opportunities for students exist across classrooms; these environmental factors affect the learning of students and their subsequent achievement. Schools are a specific type of complex organization, so established organizational theory generated in other settings is applicable to schools (Schein, 1985; Owens & Steinhoff, 1988; Owens, 2001; Owens & Valensky, 2007). Findings from the last century of research in developmental and cognitive psychology are pertinent for information on the optimum learning environments for schools (Schoen, 2008). Differences in school cultures can be documented and described using the four domains identified in Phase 1 of this study (Schoen, 2010; Schoen & Teddlie, 2008). The principles that govern effective organizational cultures for primary and secondary schools as well as the principles that govern optimum learning environments for children are global and, therefore, relevant across international settings (McInerney & Liem, 2008).

REVIEW OF THE LITERATURE

Education has been described as a multi-disciplinary field of practice (Schulman, 1987), whose tools of inquiry emanate from an array of diverse disciplines including the natural sciences, psychology, sociology, and anthropology (Chatterji, 2002). Consequently, this study embraces a multi-disciplinary approach to describe and contrast school cultures. The search for information on school culture and how to study it spanned several bodies of literature and academic disciplines. A review of relevant research and theory across several social science fields led to the mixed model research design of the study described here.

The literature review also resulted in the development of a new model of school culture (Schoen & Teddlie, 2008) that was used to frame the study. The intent of this chapter is not to present the findings of the study in full, but to focus on insights about the school-level conditions that support high-quality learning environments associated with gains in student achievement.

Student Learning: Insights from Developmental and Cognitive Psychology

Developmental psychology focuses on how people grow, adapt, and change. Research in developmental psychology has contributed much to our understanding of human physical, socio-emotional, personality, cognitive, language, and moral development over the past century (Slavin, 2000). Theories of human development differ in terms of whether the growth and change is considered to be gradual and continuous from infancy to adulthood, or whether it proceeds through a series of preset common stages.
Many of those that have been most influential in the field of education have been discontinuous or “stage” theories of human development that assert that all children progress through invariable stages of development in a predictable sequence. Such theorists believe that children develop qualitatively different understandings, abilities, and beliefs at each stage of the progression (Epstein, 1990).

Cognitive Development

Cognition refers to the human thought processes. Cognitive psychologists have researched the development of thought extensively over the past century and have helped us understand a great deal about the conditions that foster the development of thinking and reasoning ability. While there are many that might be discussed here, the works of two cognitive psychologists, in particular, stand out as having contributed greatly to our awareness of factors important in learning environments. These psychologists are referred to as constructivists because they believe that knowledge must be constructed by the learners. Constructivists, in contrast to behaviorists, do not believe that awareness of information constitutes knowledge, unless the learners have constructed their own web of meaning pertaining to the information.

Piaget’s Stages of Cognitive Development

Jean Piaget, a Swiss psychologist born in 1896, believed knowledge comes from action (Wadsworth, 1996); his theory of cognitive development (Piaget, 1952; Piaget & Garcia, 1986) has been extremely influential over the past century. Piaget believed that all children are born with an innate predisposition to interact with their environment and to make sense of their experiences (Slavin, 2000). In Piaget’s view, intellectual or cognitive abilities develop gradually over time as the child moves through a series of stages in which mental processes become increasingly complex and sophisticated. Piaget’s distinct stages are each characterized by the emergence of new abilities and ways of processing information.

Cognitive development, according to Piaget, occurs as children generate schemes, or mental patterns that guide their behavior. Changes in thinking are produced as children assimilate new objects and experiences into their preexisting schemes or accommodate their scheme to fit interactions with a new object or concept.

Piagetian theory has influenced educational environments, curriculum, materials, and methods in several ways:

- It has shifted the focus onto the process of thinking rather than the product of the effort.
- It has drawn attention to the importance of active involvement in learning, self-initiation of inquiry, and away from the traditional didactic approach to teaching.
- It has fostered the emergence of developmentally appropriate practices in the education of young children, rather than expecting them to behave and learn like adults.
- It has led to the acceptance of individual differences in the developmental process (Berk, 1997, p. 244).
Lev Vygotsky, a Russian psychologist, emphasized the role of the social context on the thinking abilities of children. He believed that cognitive development occurs through a process known as self-regulation, in which the child internalizes signs and learns to use them to think and solve problems independently.

The first step in the development of self-regulation and independent thinking is learning that an abstract sign or symbol has meaning and is used in systematic ways. Then children practice and experiment with using signs in various ways and contexts, with and without assistance, until the signs and their systems are mastered. Finally, children realize that they can use the signs and systems to solve problems without the help of others.

Vygotsky also observed that children incorporate the speech of others into their communications and then use that speech in various ways to help them solve problems. In the process of making the speech, they have heard their own, young children often talk to themselves and rehearse using speech. As the child matures, self-talk is internalized and remains an important learning and self-regulation tool. Children who make extensive use of self-talk learn complex tasks more effectively than those who do not (Bivens & Berk, 1990).

Vygotsky’s work on the role of social interaction in learning led to the description of two principles that have been extremely important in helping us to understand attributes of learning environments that stimulate cognitive growth. These are the concepts of scaffolding and the zone of proximal development; both ideas emphasize the importance of social learning and interactions with others during the learning process.

Scaffolding occurs when competent peers or adults help children as they struggle to develop greater understanding of complex concepts. Typically scaffolding involves providing a novice with a great deal of support in the early phases of learning, then gradually phasing out the support, requiring children to take increasing responsibility until they can complete the task alone.

However, Vygotsky’s most influential idea from an educational standpoint was the concept of the zone of proximal development (see Vygotsky, 1978, pp. 85–91). Vygotsky believed that children make the greatest cognitive growth when working on tasks slightly too difficult for them to complete alone, but easy enough to do with the assistance of others. His experiments demonstrated that children are capable of higher mental functioning when they work collaboratively with peers to solve complex problems. He observed that when small groups of children worked together on tasks, none could perform alone. Their interactions and brainstorming often advanced the complexity of their thinking until they were able to successfully solve the problem. This process of learning together is referred to as the social construction of knowledge, and learning environments that offer these types of opportunities allow students to experience a great deal more cognitive growth than environments where students work exclusively on independent learning activities.
Dewey’s Version of Pragmatic Social Constructivism
John Dewey, an American contemporary of Piaget and Vygotsky, also had a dramatic impact on our understanding of appropriate learning environments. Dewey’s notions of learning, and how to enhance learning in schools, have been influential in educational practice. The themes present in his writings bear much similarity to those in mainstream cognitive constructivist theories, such as those of Piaget and Vygotsky.

Garrison (1998) refers to Dewey’s theories about inquiry, learning, and education as pragmatic social constructivism. A major area in which Dewey’s ideas depart from other cognitive constructivist theories, however, is his insistence that education should not focus on cognition alone, but must include the physical and affective domains. For Dewey, the three were inseparable. Dewey frequently reminded educators to include the body, its actions, and its passions more predominantly in the curriculum (ibid., p. 43). “Pragmatic social constructivism urges educators to consider the entire context, the environmental ethos of schools and community within which the student as a creative individual must function in organic interconnection” (ibid., p. 60).

Several aspects of Dewey’s pragmatic approach to constructivism are summarized in Table 1. The concepts in the left column hold a prominent place in Dewey’s writings about the construction of knowledge. The statements in the right column are not direct quotes from Dewey, but embody his ideas. These statements have been paraphrased by Garrison (Hickman & Alexander Eds., 1998, pp. 63–81; Larochelle, Bednarz, & Garrison Eds., 1998, pp. 43–60), by Shook (2000, pp. 123, 176–210), and by Schoen (2010) to summarize Dewey’s ideas.

Authentic Pedagogy
Throughout most of the industrial age, learning in schools was assumed to be an individual endeavor. Behaviorist views of learning and learning environments prevailed, resulting in classrooms dominated by teacher talk, independent pencil and paper assignments, graded for correctness. Behaviorist assumptions about the nature of the learning process defined the teacher’s role as one who shares information and assesses the extent to which individuals absorbed it. This model of teaching and learning became and remains the predominant guide for learning environments around the world.

However, despite a rocky start, cognitive constructivism grew in popularity in the late 20th century (Schoen, 2008). Constructivists focused on re-creating learning environments to allow for greater interactivity during learning and greater student engagement in direct inquiry. Concern emerged over the intellectual merit of students’ tasks in schools. Learning theorist Theodore Sizer and others asked “to what extent do activities assigned to students require them to use their minds well?” (Sizer, 1985, p. 109; Newmann & Wehlage, 1993; Newmann, Wehlage, & Secada, 1995; Newmann, Doane, Gamoran, King, Kruse, Seashore-Louis, Marks, Osthoff, Porter, Secada, Wehlage, & Weinstein, 1996). As Dewey before them, they complained that the topics covered and methods used in school seemed disconnected from students’
### Table 1. Summary of Dewey’s Pragmatic Views of Knowledge Construction

<table>
<thead>
<tr>
<th>Topic</th>
<th>Summary of Views</th>
</tr>
</thead>
<tbody>
<tr>
<td>The value of education</td>
<td>Educational value is not intrinsic to subject matter. Its value in any given subject matter depends on its contribution to the growth of the learner. If the subject matter does not connect to the student’s present state of knowledge, needs, and interests, it has no pedagogical value for the individual on that occasion.</td>
</tr>
<tr>
<td>The act of teaching</td>
<td>Teaching involves the coordination of the teacher, the student, and the subject matter. We never educate directly, but indirectly by means of the environment – we design environments.</td>
</tr>
<tr>
<td>The role of the teacher</td>
<td>The teacher must strive to connect the subject matter with the student’s present needs and abilities. The educator’s task is thus to arrange the subject matter so as to make it most accessible to each student. There must be an effort to organize subject matter so as to coordinate it with each student’s needs, interests, and abilities.</td>
</tr>
<tr>
<td>The importance of the learning environment</td>
<td>Education does not necessarily involve teachers. Sometimes it simply involves the design of better learning environments.</td>
</tr>
<tr>
<td>The need for direct involvement of students in inquiry</td>
<td>Mere presentation of the results of the inquiry of others, in the form of facts to be learned, is often a barrier to learning because it does not connect the student’s present needs, interests, and abilities to the knowledge; it is thus meaningless to him or her.</td>
</tr>
<tr>
<td>The construction of meaning</td>
<td>Natural inquiry is the process by which humans observe their environment and construct meaning. Observations that do not fit with current constructions of reality create within the individual a state of disequilibrium, which results in the deconstruction of ideas and the reconstruction of understanding of the state of affairs, followed by the restoration of equilibrium.</td>
</tr>
<tr>
<td>The role of experience in the construction of meaning</td>
<td>Experience is the result of our transactions with our environment. The value of an experience to the construction of meaning lies in the perception of the individual of continuities of experience. Meanings emerge when through reciprocal coordination of behavior we render something common between two or more centers of action.</td>
</tr>
<tr>
<td>The circular relationship of activity, idea, and emotion</td>
<td>Activity is essential to experience. Activity denotes the essence of the mind and the essence of the individual organism in its environment. The mode of behavior is the primary thing. It represents the stimulus, the idea, and the emotional excitation, the response. Similarly, the idea and the emotion produce a response that makes up the mode of behavior.</td>
</tr>
<tr>
<td>The process of mental activity and its product</td>
<td>The tendency is to shun isolated elements and to force connections wherever possible; this is the fundamental law of mental activity. The discovery of laws, the classification of facts, and the formation of a unified mental world, are all outgrowths of the mind’s hunger for the fullest experience possible at the least cost. The organic growth of experience is the final aim of mental activity.</td>
</tr>
<tr>
<td>The role of communication in education</td>
<td>Communication is a form of art that has immense educational importance. Language is thoroughly social; meanings do not come into being without language, and language implies two selves involved in a conjoint or shared undertaking.</td>
</tr>
<tr>
<td>Educational methods</td>
<td>Educators must learn that there is no one best method of education. There is no one best way to grow. Teaching is a transactional, artistically transformative creative activity of assisting students in the making of meaning.</td>
</tr>
</tbody>
</table>
experiences beyond school. This, they argued, caused rampant apathy and low morale in students, who were bored and intellectually disengaged. According to Dewey, students are not motivated to learn when they fail to see the relevance of the topics and/or tasks assigned. The learning that does occur is of a rote nature. In the words of Dewey, this sort of schooling is “mechanical and dead” because natural curiosity (or a self-perceived need-to-know), followed by direct inquiry, are not present. Interest coupled with inquiry supplies motivation for students. Motivation, in turn, impacts their natural drive to acquire knowledge they find meaningful and useful (see The Child and the Curriculum by John Dewey reprinted in Hickman & Alexander Eds., 1998).

Newmann and his colleagues developed a method for evaluating the intellectual merit of the tasks students perform in schools, called the Criteria for Authentic Achievement. According to this framework, authentic tasks are those likely to be performed naturally by successful people in real-life situations. Newmann and colleagues’ (1995; 1996) criteria for judging authenticity in school activities or assessments is based on the extent to which the task is useful for developing or evaluating: Construction of Knowledge, Disciplined Inquiry, and Value beyond School.

Newmann and associates (1995; 1996) created standards that embody Bloom’s taxonomy of educational objectives (classifies the complexity of cognitive tasks), Dewey’s notions of meaningfulness, and direct inquiry (see Bloom, Englehart, Furst, Hill, & Krathwohl, 1956; Logic: The Theory of Inquiry by John Dewey reprinted in Hickman & Alexander Eds., 1998; Piaget, 1952; Piaget & Garcia, 1986; Vygotsky, 1978). Their work advances the understanding of effective learning environments by providing a research-based tool for judging the worth of learning tasks and assessments. The standards presented in Table 2 are broken down into two sets: standards for instruction and standards for assessment.

Social Cognitive Constructivism in Educational Practice

The view of cognitive development as a process, in which children actively build systems of meanings and understandings of reality through their own interactions and experiences with their environment, is an orientation to cognitive development referred to as social cognitive constructivism. Psychologist Robert Slavin (2000) believes that currently “a constructivist revolution is taking place in educational psychology” in which the predominant view of cognitive development is centered around constructivist theories, such as those of Piaget, Vygotsky, and others, that assert that learners must individually discover and transform complex information to make it their own. Through active experimentation, assimilation, and accommodation, learners construct and refine knowledge about the world around them.

Classroom practices based on constructivist learning theories deviate considerably from traditional didactic approaches to education, which favor behaviorist theories of learning built around Skinner’s ideas of stimulus-response relationships. Constructivist classrooms are often referred to as learner-centered because of their emphasis on the active involvement of the student in their own learning. As Slavin (2000) points out,
Table 2. Standards for Authentic Pedagogy Adapted from Newmann et al. (1996, pp. 29, 33)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Standards for Authentic Pedagogy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of knowledge</td>
<td></td>
</tr>
<tr>
<td><strong>Instruction</strong></td>
<td>Higher-Order Thinking (HOT)</td>
</tr>
<tr>
<td>Instruction involves students manipulating information and ideas by synthesizing, generalizing, explaining, hypothesizing, or arriving at conclusions that produce new meaning and understandings for them.</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td>Organization of information</td>
</tr>
<tr>
<td>The task asks students to organize, synthesize, interpret, explain, or evaluate complex information.</td>
<td></td>
</tr>
<tr>
<td><strong>Consideration of alternatives</strong></td>
<td></td>
</tr>
<tr>
<td>The task asks students to understand or use ideas, theories, and perspectives considered central to a discipline.</td>
<td></td>
</tr>
<tr>
<td>Disciplined inquiry</td>
<td></td>
</tr>
<tr>
<td><strong>Instruction</strong></td>
<td>Student engagement in inquiry</td>
</tr>
<tr>
<td>The task involves students directly in disciplined inquiry to acquire knowledge.</td>
<td></td>
</tr>
<tr>
<td><strong>Deep knowledge</strong></td>
<td></td>
</tr>
<tr>
<td>Instruction addresses the central ideas of a topic with enough thoroughness to explore connections and relationships and to produce relatively complex understandings.</td>
<td></td>
</tr>
<tr>
<td><strong>Substantive conversation</strong></td>
<td></td>
</tr>
<tr>
<td>Students engage in extended conversational exchanges with the teacher or their peers about subject matter in a way that builds on an improved and shared understanding of ideas or topics.</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td>Disciplinary content</td>
</tr>
<tr>
<td>The task asks students to understand or use ideas, theories, and perspectives important in a discipline.</td>
<td></td>
</tr>
<tr>
<td><strong>Disciplinary process</strong></td>
<td></td>
</tr>
<tr>
<td>The task asks students to use methods of inquiry, research, or communication characteristic of a discipline.</td>
<td></td>
</tr>
<tr>
<td><strong>Elaborated written communica</strong></td>
<td></td>
</tr>
<tr>
<td>The task asks students to elaborate on their understanding or conclusions through extended writing.</td>
<td></td>
</tr>
<tr>
<td>Value beyond school</td>
<td></td>
</tr>
<tr>
<td><strong>Instruction</strong></td>
<td>Connections to the world beyond the classroom</td>
</tr>
<tr>
<td>Students make connections between knowledge and either public problems or personal experiences.</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td>Problem connected to the world beyond school</td>
</tr>
<tr>
<td>The task asks students to address a concept, problem, or issue similar to one that they have encountered or may encounter in life beyond the classroom.</td>
<td></td>
</tr>
<tr>
<td><strong>Audience beyond school</strong></td>
<td></td>
</tr>
<tr>
<td>The task asks students to communicate their knowledge, present a product, performance, or take some action for an audience beyond the teacher, classroom, and school.</td>
<td></td>
</tr>
</tbody>
</table>
“in a student-centered classroom, the teacher becomes the guide on the side instead of the sage on the stage” (p. 256). The teacher’s role becomes more like a coach who assists students to discover their own meaning, rather than an authority figure lecturing from static truths and rigidly restricting movement and interaction in the classroom.

Constructivist ideology can be seen in the classroom practices such as discovery learning (Bruner, 1966), an approach that seeks to involve students in the generation of principles based on their experiences. Jerome Bruner, an advocate of discovery learning, says: “We teach a subject not to produce little libraries on that subject, but rather to get a student to think ... for himself, ... to take part in the process of knowledge-getting. Knowing is a process, not a product” (ibid., p. 72). Constructivists believe that a key task of the teacher is to arouse curiosity and motivate students to explore complex problems until answers are discovered.

For constructivists, the aim of education is not the passing along of bodies of knowledge, but it is in “teaching students to use their minds well” (Sizer, 1999). Therefore, a constructively oriented classroom strives to help students become better regulators of their own learning. Self-regulated learners have an awareness of the strategies they use to learn and an understanding of when and how to use them (Bandura, 1977; 1999). Hence, constructivist teachers often engage students in explaining the processes they used to complete their work, in order to strengthen metacognitive skills or awareness of the mental processes used in acquiring specific types of knowledge.

Cognitive constructivism assumes that the aim of education is to provide students with experiences that teach them to use their minds well, and consequently greater value is placed on the processes of learning than on the products of learning. Constructivist teachers serve as facilitators of learning, whose primary responsibilities lie in the planning of meaningful experiences, the scaffolding of learning, the promotion of learner self-regulation, as well as assessing learning and providing feedback. The impact of constructivism on schooling is that it creates classrooms where students are more likely to be encouraged to talk and interact as a part of the learning process. Methods such as learning by doing and discovery learning are advocated by constructivists because they are more likely to result in Higher-Order Thinking (HOT) in students than the traditional forms of direct instruction that allow learners to assume a passive role. However, despite the wealth of psychological research generated over the past century in support of cognitive constructivism, in many schools across the world, traditional behaviorist approaches still dominate classroom instruction. The following list summarizes some attributes of classroom learning environments consistent with research in socio-cognitive construction of knowledge:

1. Students work on some activities independently, but much of their time in the classroom includes working in cooperative groups composed of peers functioning at a variety of cognitive levels.
2. The teacher scaffolds student learning by providing more assistance early on and requiring learners to take increasing responsibility for their learning tasks as their learning progresses.
3. Classroom activities include independent activities that students can complete
on their own, and also more difficult learning experiences in which students
work collaboratively to solve mutual complex problems.

4. Eventually, the role of the student as a director of learning supersedes that of
the teacher. The teacher becomes a facilitator of learning who monitors and
stimulates students to seek progressively greater insights.

5. The types of activities that students explore in school have practical value and
utility in the world outside of school. This is motivational to students, who
frequently present their work to others including people outside the classroom.

6. Evaluating student learning involves assessing student-generated work on
authentic performances or products for an audience, possibly beyond the
classroom.

7. Students receive guidance in “learning how to learn.” They develop a meta-
cognitive awareness of the processes they use to learn; this helps them learn
to self-regulate their learning processes and to assume increasingly greater
responsibility for directing their own learning.

8. Student enthusiasm is high because their learning is meaningful to them.
Students are encouraged and challenged to pursue their interest on a deeper
level through active inquiry.

9. Students function as members of a social group, but also as individual learners.
The pacing and depth of student inquiry is individualized to fit their particular
needs.

10. Teachers are skillful monitors of student progress and provide coaching to
redirect or assist students as needed.

APA Learner-Centered Psychological Principles

In 1998, Spielberger called upon the psychological community to make a greater effort
to share their collective wisdom with educators and to actively suggest ways that schools
and teachers could establish more stimulating and effective learning environments for
In response, the American Psychological Association (APA) put together a task force
on psychology in education. The APA task force identified 14 core evidence-based
principles to guide educational practice (Learner-Centered Psychological Principles: A
Framework for School Redesign and Reform, 1997). These 14 principles, collaboratively
devised by highly qualified psychologists, firmly supported the social cognitive
constructivist perspective and were aptly named Learner-Centered Psychological
Principles. Murphy and Alexander (2002) performed an exhaustive literature review
that validated these principles and grouped the vast body of psychological research
on learning into five broad dimensions: development, knowledge base, motivation/affect,
strategic processing/executive functioning, and situation/context. This study
falls firmly into the situation/context category, which has also been dubbed a socio-
cultural constructivist perspective (McInerney, 2005, p. 587; McInerney & Liem,
School Culture

Teachers perform their work within the larger school environment. Classroom learning environments are but one of the dimensions that comprise a school’s organizational culture. School culture can be thought of as a school’s reaction to its internal and external demands. These demands along with its history, traditions, and belief systems shape countless aspects of the day-to-day functioning in the school. Each school’s culture is a unique expression of who they are and what they value (both explicitly and implicitly). Culture is the means by which a school establishes a unique self-identity and the lens through which participants view themselves and the world (Hargreaves, 1994, pp. 163–186). School culture determines how teachers, principals, and other school staff perform their jobs.

A number of (external) forces act upon schools and the people running them. Variation in external forces, combined with diverse reactions and value systems of staff at different school sites, results in each individual school having its own culture, separate and unique even from neighboring schools with which they have much in common. School culture involves both norms of behavior and the underlying beliefs and assumptions that maintain it, therefore, school culture is elusive and difficult to define because it is not directly observable (Stoll & Fink, 1996). Surface-level indicators of deeply held beliefs and values may include behavioral regularities or norms, rituals, language usage, organizational philosophy, variations in policy implementation, informal rules for getting along with colleagues, procedures, opinions, traditions, symbols, distinguishing characteristics, ceremonies, and stories (Hoy & Miskel, 1991; Schein, 1985; 1992; Stoll & Fink, 1996). Most researchers (e.g., Deal & Peterson, 1999; Fullan, 1993; 1999; 2000; Hargreaves, 1991; Lieberman, Darling-Hammond, & Zuckerman, 1991; Murphy, 1991; Murphy & Hallinger, 1993) believe that school culture can be changed over a period of time, though there is no agreement on the exact processes. Common threads in the literature are that cultural change is necessary for meaningful school improvement, this involving some form of on-going professional development of teachers, and alterations in the school structures, the end result being a greater focus on student learning (Halsall, 1998, p. 33).

There are many definitions of school culture; the one utilized here is multi-dimensional, based on a review of the literature (Schoen, 2010; Schoen & Teddlie, 2008) in which four dimensions of school culture were identified: the Professional Orientation of the school’s faculty, the Organizational Structure of the school, the Quality of the Learning Environment, and the Student-Centered Focus of the supplemental services offered by the school. The discussion at the end of this chapter lumps these dimensions into two types: Aspects of operations that are primary to the work of teachers (Dimension 1. Professional Orientation and Dimension 3. Quality of the Learning Environment), and attributes that are school-level functions typically performed by school staff other than teachers, and to a lesser extent by individual teachers (Dimension 2. Organizational Structure and Dimension 4. Student-Centered Focus).
RESEARCH METHODS

Selection of Schools

Matched Pairs

This study compared the organizational cultures of schools that improved student achievement over a two-year period, with similar schools that were unsuccessful in this endeavor. Thick descriptions of school culture were generated for all six schools (Schoen, 2010), but these will only be discussed here to the extent that they reveal insights relative to supporting the work of teachers from a socio-cultural cognitive constructivist point of view.

Schoen (2010) employed a comparative case research design using the school as the level of analysis. Comparisons were made between matched schools. Matched pairs were identified on the basis of similar context, but maximum difference in the degree of improvement in student achievement was shown over a two-year period. Matching schools was necessary to control extraneous variables, so that the schools that were compared were very similar in all major respects, except the variable of contrast that was the amount of school improvement achieved. Three pairs of schools were formed that had very similar characteristics in the following areas:

1. Same state (further controls for variation in policies and funding);
2. Same school district (further controls for variation in policies and funding);
3. Same community type (urban, suburban, or rural context);
4. Not participating in a structured externally developed improvement initiative;
5. No external experts or consultants were involved with the school;
6. No student selection mechanism was employed that would interfere with the presence of a heterogeneous student body with respect to achievement;
7. Student body poverty level (controls for variations in home life due to poverty effects);
8. Title I status (determines the amount of compensatory funds received from the U.S. Federal Government);
9. Number of principals on-site (including assistant principals);
10. Similar school enrollment; and
11. Same school level (grade configuration: elementary school/middle school/high school).

Purposeful matching ensured that the populations served by the schools were comparable and also served to control for the effects of variables external to the internal operations of the schools studied. External contextual characteristics such as district-level policies, curricula, and community type could impact the school culture differentially; therefore, it was necessary to hold these variables as consistent as possible. Ensuring comparability on these characteristics helped to rule out alternative explanations of differences in school increases in student achievement, thus, allowing more credible assertions that the differences in student achievement were due to internal socio-cultural aspects of school operations.
Extreme Cases Contrasted

Extreme-case sampling (Patton, 1990; 2002) helped to ensure that paired schools exhibited maximum contrast in the variable of contrast – improvement in student achievement over a two-year period. The state generated school accountability index score was used to select extreme cases. The school sampling process involved a double blind strategy in which those involved in data collection and analyses were unaware of the effectiveness status of the schools until after data collection. The use of extreme case sampling enabled researchers to contrast the internal operations of matched schools to ascertain if there were definite differences in the way things were done at improving versus non-improving schools.

Three pairs of matched schools were identified and agreed to participate in the study. Matched schools were similar in most respects. However, there was a large difference in the two-year trend in student test scores. In each pair, one school had scores that were improving, and one school’s scores were declining. Therefore, most of the variables other than internal operations were controlled for, enabling us to document aspects of the organizational culture in all schools. In addition to allowing for contrasts within matched pairs, extreme case sampling allowed researchers to compare cultural norms across pairs to identify patterns or commonalities in the cultures of improving versus non-improving schools.

Data Collection

Data collection took place over 15 months and involved 20 data sources per school. The studies of culture in each school were replicated as closely as possible to avoid unintended errors due to variations in data collection methods. The case studies involved the collection and analysis of both qualitative and quantitative data. The mixed method case study approach permitted consideration of a wealth of different types of indicators, which can be important in measuring complex constructs such as school culture, especially when the available research and theory bases are limited.

School cultures were compared along the following dimensions: Professional Orientation, Organizational Structure, Quality of the Learning Environments, and Student-Centered Focus. The use of multiple cases, an approach referred to as embedded multiple case design, allows for the cross comparison of cases on select characteristics (Yin, 1994, pp. 41–52); in this project, descriptions of norms and values in the four dimensions of a school’s culture were compared to those of their matched pair. Comparisons of schools were not made across pairs due to incomparable settings, which could possibly have accounted for differences in observations, thereby invalidating the causal value of the study. However, once contrasts within each pair were completed, the results for all three pairs were examined for common patterns of differences between improving and non-improving schools.
Within School Sampling

Three Levels of Data
Teddlie and Reynolds (2000, p. 82) called for more complex multi-level analyses of process variables within schools. Consequently, three units of analyses were included in this study: school-level indicators, teacher/class-level indicators, and student/parent-level indicators. Table 3 lists the data types collected at each participant level.

Table 3. Data Types by Level

<table>
<thead>
<tr>
<th>School</th>
<th>Teacher</th>
<th>Student/Parent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal interview, structured open-ended questionnaire</td>
<td>Teacher self-administered survey, fixed response</td>
<td>Parent phone survey, fixed and open-ended response</td>
</tr>
<tr>
<td>Informal interviews and observation of counselor, assistant principal, and other school-level staff</td>
<td>Teacher-focus group and self-administered open-ended survey</td>
<td>Student-focus group</td>
</tr>
<tr>
<td>Informal observations of school</td>
<td>Random observations for use of authentic pedagogy, stratified by grade, unannounced times</td>
<td>A Day in the Life of a Student, observation and field notes</td>
</tr>
<tr>
<td>Document analysis</td>
<td>Semi-structured interviews</td>
<td></td>
</tr>
</tbody>
</table>

Methods of Collecting Teacher-Level Data
Teachers were randomly selected and observed at random unannounced times at meetings and during instruction over a period of 15 months. This strategy allowed researchers to get a better feel for the typical activities that characterize the way they function within their schools. Classroom observations utilized a rubric based on the standards for authentic pedagogy by Newmann et al. (1996) because this framework strongly embodies the research-based principles of social cognitive constructivism (see literature review). Informal follow-up interviews were sometimes held to solicit an explanation from teachers for why they employed the methods observed.

Observation of meetings and planning sessions helped to ascertain the degree of collegiality, the extent of problem identification and solving, and the general resourcefulness of teachers in dealing with problems they encountered with students. One-on-one interviews about how teachers perceived their role in the school were analyzed and aggregated to understand whether most teachers in the school typified a workforce mentality (e.g., thinking about their work as a job in which they were required to execute well-defined behaviors in a job description) or a professional orientation (e.g., understanding their role as vaguely defined around the core responsibility of
generating adequate cognitive growth in all students). Observation notes were made of teachers’ skills in problem identification and their resourcefulness in accessing and utilizing a body of specialized knowledge to accomplish their goals relative to student learning. Teacher focus groups allowed teachers to describe how they handled various situations. These groups shed a great deal of light on the collective values held by the teachers and school staff. Surveys for each of the four dimensions of culture provided teacher perceptions on many aspects of school functions.

_Trustworthiness and Credibility_

Several steps were taken to increase trustworthiness and add to the overall quality of the inferences drawn in this study (Tashakkori & Teddlie, 1998, pp. 90–93). These include:

_Replication of Results_

Multiple matched pairs were used to increase the trustworthiness of the findings by allowing for the replication of results. Yin (1994, pp. 45–46) stated that replicated results are considered more compelling, and the study is therefore more robust (see also Herriot & Firestone, 1983). Replicating of findings across cases also allows an opportunity for theory building because the results provide a basis for stating the conditions under which the phenomenon (here, gains in student achievement) is likely to be found and conditions under which it is likely not to be found.

_Mixed Method Design_

The mixed methods case study approach used in this study allowed for both numeric and verbal data sources to be collected for each dimension. The purpose for the multiple measures is twofold. First, including multiple data points and sources allows researchers to see multiple aspects of a phenomenon, yielding more accurate information. Secondly, and more importantly, it allows for more detailed descriptions of the variables, which is highly desirable in an exploratory study.

_Prolonged Engagement_

Contact with each school started before the school year started for the students. The bulk of the data was collected at each site in three contiguous weeks on-site. Follow-up visits were made to each school site intermittently as needed over the duration of the 15-month data collection period. This strategy allowed enough time for the researcher to become familiar with the scope of the contextual factors.
Persistent Observation

At each school, a single teacher was selected as key informant. A strong rapport was established with this teacher, and each time the school was visited the researcher tried to speak with this person. The primary purpose of having a single teacher act as a key informant is to add depth to the descriptions of culture by including subtle details that may surface only through the familiarity of daily informal interactions with an insider to the cultural scene.

Peer Debriefing

Following data collection and prior to the completion of data analyses, debriefing sessions were conducted in which the primary researcher discussed thoughts and impressions with a colleague not involved in data collection for this project. The purpose of this process was to explore aspects of the inquiry that might otherwise never be made explicit. Debriefing is also useful to probe for biases and to assist with interpretations (Lincoln & Guba, 1985, p. 308; Tashakkori & Teddlie, 1998, p. 91).

Member Checks

Whenever possible, faculty members were asked to check interpretations and conclusions drawn by the researcher to confirm that representations are accurate portrayals based on their experience at the school.

Reflexive Journal

A journal is kept alongside of the ethnographic notebook that details information about the circumstances, the context of the situation, methodological decisions, and the events, questions, or comments that arise.

Triangulation

The use of multiple data points allowed data collected in one format to be confirmed or contradicted by data from other sources. The use of triangulation techniques provided a safeguard from the formulation of erroneous inferences.

RESULTS

A wealth of information was collected at each school; consequently, the information for each school was reduced to individual units and categorized by content. This method of content analysis is recommended by Patton (1990, pp. 381–389). Units of information from various data sources were triangulated to condense the data and reduce replication. Each important unit of information was categorized as a school
strength or as a school weakness in terms of whether it contributed to or detracted from overall school effectiveness. These units of categorized information about school functions were listed on Data Reduction Charts. A separate Data Reduction Chart was created for all four dimensions of each school. The Data Reduction Charts summarize key elements of each dimension of the school’s culture. At least two different data sources were present for each unit of information displayed on the charts.

**Dimension 1: Professional Orientation of the Faculty**

The data that most succinctly informed descriptions of operations in Dimension 1 were: 1) the formal principal interview, 2) informal subsequent principal interviews, 3) the teacher focus group, 4) informal conversations with teachers, when the circumstances permitted, and 5) observation of faculty meetings and/or small group planning sessions. These data along with field notes and post observation/interview notes helped researchers understand not only what students were doing in classrooms, but why the assignments were made and how teachers were selecting instructional methods and materials. These data were used to assess the rigor and robustness with which each faculty pursues acquisition of greater knowledge and skills relevant to planning classroom instruction, which is the heart of a Professional Orientation. The Data Reduction Charts in Table 4 display the attributes of professionalism demonstrated by matched Pair A. Even a casual observer can easily tell that teachers’ orientations to their work are very different in these schools despite outward appearances of similarity.

**Dimension 2: Organizational Structure**

Dimension 2 of school culture involves the processes, policies, rules, rituals, routines, traditions, role interpretations, and scheduling patterns used to organize life in schools. Data on these organizational structures included teacher and principal interviews, informal school observations, and information provided on a Sociometric Survey (SS). Graphic representations of the Organizational Structure and Leadership patterns found at each school were created to symbolize the degree of distributive leadership and collegiality in schools. The attributes noted in the leadership and organizational structure at each school included: 1) the numbers and placement of informal leaders, 2) the presence and degree of collegiality of collaborative teams, 3) the relative number of autonomous or social isolate teachers, and 4) the closeness of the principal to members of the faculty (based on SS data, self-report comments in interviews, and observed patterns of interaction). The data revealed that the improving schools tended to be more unified.

**Relationships between Teachers and Principal**

In all three pairs, the teachers at improving schools were closer to their principal in ideology and practice on a whole host of issues involving organization, management,
and communication. This suggests that teachers in improving schools work more closely with principals than their counterparts in non-improving schools. It also suggests greater unity in the faculty is associated with successfully changing mean student achievement within schools. For example, the teachers in improving schools A2, B2, and C2 were observed talking more spontaneously with their principals than the teachers in the paired schools. They frequently approached the principal in the hall

### Table 4. Data Reduction Charts Dimension 1 – Pair A

<table>
<thead>
<tr>
<th>D1 Strengths</th>
<th>D1 Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>A formal School Improvement Plan (SIP) was developed based on data (unclear how collaborative the process was).</td>
<td>Few teachers are aware of SIP content except that reading and math scores were low and the school needs to improve on them.</td>
</tr>
<tr>
<td>Instructional assistance is available through the Teacher for Instructional Support (TIS).</td>
<td>No in-depth on-going programs, interventions, plans, or strategies are being implemented to address documented achievement deficits.</td>
</tr>
<tr>
<td>Some teachers are independently involved in professional communities beyond the school.</td>
<td>Strong norms of teacher autonomy exist and interfere with meaningful teacher collaborations.</td>
</tr>
<tr>
<td>Some teachers try to use data to identify students’ needs on their own and modify their instruction accordingly.</td>
<td>Teacher efficacy to change student achievement is low.</td>
</tr>
<tr>
<td>Teachers clearly rely on TIS as instructional leader, but TIS confided plans to leave school.</td>
<td>A sense of academic frustration prevails among teachers; some feel the difficult home lives of students override anything that happens at school.</td>
</tr>
<tr>
<td></td>
<td>The academic push for students to perform to higher standards is weak.</td>
</tr>
<tr>
<td></td>
<td>Veteran teachers are skeptical that new teachers “have what it takes to make it here.”</td>
</tr>
<tr>
<td></td>
<td>Faculty meetings deal more with business, not with professional learning.</td>
</tr>
<tr>
<td></td>
<td>Staff development is not focused and ongoing.</td>
</tr>
<tr>
<td></td>
<td>Teachers are not engaged in self-reflection about their instruction.</td>
</tr>
<tr>
<td></td>
<td>Little enthusiasm or positive teacher attitudes are observed.</td>
</tr>
<tr>
<td></td>
<td>Frequent expressions of frustration are made.</td>
</tr>
<tr>
<td></td>
<td>Many are eager to leave at the end of the day.</td>
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<tr>
<td></td>
<td>Teacher commitment is inconsistent, the turnover is high, with only a few long-timers.</td>
</tr>
<tr>
<td></td>
<td>Teachers are not highly engaged in faculty meetings.</td>
</tr>
<tr>
<td></td>
<td>Teachers, their aides, and principals are wary of outsiders and newcomers.</td>
</tr>
<tr>
<td></td>
<td>There is little talk regarding instruction in teacher conversations.</td>
</tr>
</tbody>
</table>
The teachers at schools with high student achievement tended to have more favorable views of their principal; the notable exception to this was school B1 where there was a feud over the leadership style of the new principal. Principal leadership style and a combination of other factors within the organizational structure seem to contribute to the school’s improvement status more than principal tenure alone.

Table 4. (Continued)

School A2 (Improving) Professional Orientation Data Reduction Chart

<table>
<thead>
<tr>
<th>D1 Strengths</th>
<th>D1 Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>– A formal School Improvement Plan (SIP) was collaboratively developed based on data.</td>
<td>– Strong norms of teacher autonomy exist and interfere with meaningful teacher collaboration.</td>
</tr>
<tr>
<td>– Instructional supports for change are available to teachers through the principal and the outside consultant.</td>
<td>– Teachers are not engaged in structured self-reflection about instruction.</td>
</tr>
<tr>
<td>– Many teachers are independently involved in professional communities beyond the school.</td>
<td></td>
</tr>
<tr>
<td>– Teachers frequently engage in joint voluntary professional growth activities.</td>
<td></td>
</tr>
<tr>
<td>– Teachers frequently share new ideas and instructional methods with each other.</td>
<td></td>
</tr>
<tr>
<td>– School-wide strategies are used to identify students’ needs at the school, grade, teacher, and student-level.</td>
<td></td>
</tr>
<tr>
<td>– Student achievement data is used to modify instructional programs.</td>
<td></td>
</tr>
<tr>
<td>– Teachers are aware of SIP content; many programs, interventions, plans, strategies, and ongoing professional development address documented achievement deficits.</td>
<td></td>
</tr>
<tr>
<td>– A high-level of teacher enthusiasm, commitment, and collaboration exist.</td>
<td></td>
</tr>
<tr>
<td>– Staff development is focused on a central theme identified through student achievement data.</td>
<td></td>
</tr>
<tr>
<td>– The focus of staff development is continuous for at least a year.</td>
<td></td>
</tr>
<tr>
<td>– Teachers have written and received numerous competitive grants to improve instruction.</td>
<td></td>
</tr>
<tr>
<td>– A strong academic push for students to perform to higher standards prevails.</td>
<td></td>
</tr>
</tbody>
</table>

or at lunch and shared thoughts or current events, and when questioned informally about the principal, they typically held that person a higher regard.

The teachers at schools with high student achievement tended to have more favorable views of their principal; the notable exception to this was school B1 where there was a feud over the leadership style of the new principal. Principal leadership style and a combination of other factors within the organizational structure seem to contribute to the school’s improvement status more than principal tenure alone.
Collegiality among Teachers
The interviews revealed that the improving schools were more likely to have close alliances between groups of teachers, and these groups were more likely to be highly collaborative and productive. The non-improving schools had a higher degree of teacher autonomy than the one effective non-improving school. This indicates that teacher collaboration is associated with greater school effectiveness, which is consistent with the body of literature on effective schools; however, the presence of a highly collaborative, highly effective, yet non-improving school suggests that teacher teaming alone is not enough to effect change in student achievement.

Informal Teacher Leadership
It was anticipated that improving schools would have a higher number of teacher leaders than non-improving schools, but this was not the case. However, one difference that was noted in the informal leadership norms was that the teacher leaders at improving schools tended to be more evenly distributed throughout the organization and interacted with a greater number of teachers than the leaders at non-improving schools. At non-improving schools, these individuals tended to work more independently or to limit collaborations to a small group of other teachers, particularly those they found to be like-minded – creating a “cliquish” sort of atmosphere with their own little subculture within the school. While these teachers perform many functions in the school, they do not necessarily feel valued or socially accepted by the other faculty members. This may be because of professional jealousy, differences in values/philosophies, or that they function so differently than their peers that they do not feel comfortable working closely with teachers who embody the mainstream school cultural norms better than they do. The isolation of teacher leaders in non-improving schools is an interesting and unexpected finding. Subcultures among teachers in a school is a topic that should be explored in greater depth with subsequent research.

Stability in the Principalship
Another insight gained had to do with the relationship of leadership, particularly leadership stability, and change. Due to the volume of literature associating principal leadership with school effectiveness, and leadership in general, with organizational change, it was anticipated that instability in the principalship would be associated with a school’s growth status. This seemed to be the case in two of the three pairs studied. The non-improving schools in Pair A and Pair B had both experienced recent and multiple turnovers in their principalship in the years prior to and including the year of the study. However, the non-improving but effective school in Pair C had a stable, well informed principal who was well respected by the faculty.

Conversely, the improving school in Pair B experienced a traumatic midyear change of principal but continued to function effectively. Likewise, the principal in the improving school in Pair A had only been on the job for two years at the time of the study. These observations indicate a weak association, at best, between principal stability/tenure and school improvement.
Dimension 3: Quality of the Learning Environments

Dimension 3 of school culture pertains to the quality of the experiences learners typically have in classrooms across the school. High-quality learning environments are defined as those consistent with the principles of social cognitive constructivism. The most dramatic differences between the learning environments in improving schools, and their matched non-improving schools, was the amount of Higher-Order Thinking going on in the classroom. The students at improving schools were involved in substantially more Higher-Order Thinking. This pattern was true for all three pairs. In non-improving schools, there was less substantive discussion and the students were presented with far fewer challenges and opportunities to figure things out for themselves than were their counterparts in improving schools.

In general, improving schools had more positive classroom learning environments than other schools including the one high performing but non-improving matched school. Significant differences were also found in the amount of Deep Knowledge and Real World Relevance the students were exposed to in typical classroom activities, factors considered important aspects of authentic pedagogy (Newmann et al., 1996). The students in improving schools also faced fewer distractions detracting from their engagement in learning tasks.

Table 5 shows the Data Reduction Charts for Dimension 3, the Quality of the Learning Environment. The charts display differences in the major attributes of the learning environments of the schools in Pair A; A2 is the improving school. Findings for Pair B were similar, findings for Pair C contrasted less, but the improving school still had more positive qualities in classroom learning environments than its high performing but non-improving matched school. Table 5 displays the huge differences found in the amount of Higher-Order Thinking, Deep Knowledge, Real World Relevance, and the amount of distractions detracting from student engagement in learning tasks, in Pair A.

Dimension 4: Student-Centered Focus

To ascertain what each school was doing to provide individual students with the support necessary for academic success, several sources were consulted. The first data source was the School Improvement Plan (SIP) mandated by the state. A SIP typically lists all externally created programs in which the school participates. It sometimes also outlines procedures or strategies developed by the school in an attempt to address documented weaknesses. School handbooks and websites were also consulted. However, as is always the case with culture, there are many “ways of being and doing” (i.e., cultural norms) that are never formally articulated anywhere. Consequently, the principal was formally interviewed once, and numerous informal conversations were ensued with counselors and various school staff in an attempt to not overlook things the school was doing, or neglecting to do, that impact student success. Likewise, a teacher focus group was held and followed up with many informal conversations. The student interview protocol contained questions about what teachers or the school...
Table 5. Data Reduction Charts Dimension 3 – Pair A

School A1 (Non-improving) Quality of the Learning Environments Data Reduction Chart

<table>
<thead>
<tr>
<th>D3 Strengths</th>
<th>D3 Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instructional resources</strong></td>
<td><strong>Higher-Order Thinking (HOT) vs. Lower-Order Thinking (LOT)</strong></td>
</tr>
<tr>
<td>- Classes were well equipped with a wide range of instructional resources.</td>
<td>- Of the classes observed, 57.2% engaged students mostly or only in LOT.</td>
</tr>
<tr>
<td>- Instructional resources were in use by students in most of the classes.</td>
<td>- 42.8% engaged students more in LOT than HOT.</td>
</tr>
<tr>
<td>- Classes are bright and cheerful with informational and motivational displays.</td>
<td>- No classes observed engaged students only or mostly in HOT.</td>
</tr>
<tr>
<td>- Student lessons in the computer lab are coordinated with content in the regular classroom.</td>
<td><strong>Deep knowledge</strong></td>
</tr>
<tr>
<td>- TIS assists with instruction in some classes resulting in more teacher attention for some students.</td>
<td>- In 85.8% of classes, knowledge exploration was very thin, superficial, or fragmented.</td>
</tr>
<tr>
<td></td>
<td>- In 14.3% of observations, knowledge exploration was uneven, shallow at times and deep at others.</td>
</tr>
<tr>
<td></td>
<td>- In none of the observations was deep exploration of knowledge sustained by most students.</td>
</tr>
<tr>
<td></td>
<td><strong>Real-world relevance</strong></td>
</tr>
<tr>
<td></td>
<td>- In 80% of observations, few or weak connections were made between class activities and their relevance in the real world beyond school.</td>
</tr>
<tr>
<td></td>
<td>- In 20% of observations, connections between class activities and the importance of the content or skills in the real world were made clear to students.</td>
</tr>
<tr>
<td></td>
<td><strong>Student engagement</strong></td>
</tr>
<tr>
<td></td>
<td>- In 85.7% of observations, student engagement in learning was passive; students were compliant, but displayed little enthusiasm, interest or motivation.</td>
</tr>
<tr>
<td></td>
<td>- In 14% of the classes observed, most students participated and remained on-task with moderate amounts of interest and enthusiasm.</td>
</tr>
<tr>
<td></td>
<td>- In none of the classes were students enthusiastically engrossed in their learning activities, displaying high levels of interest and motivation.</td>
</tr>
<tr>
<td></td>
<td><strong>Distractions</strong></td>
</tr>
<tr>
<td></td>
<td>- In 14.3% of classrooms, severe distractions persisted and visibly interfered with student learning.</td>
</tr>
<tr>
<td></td>
<td>- In 71.5% of classes observed, small to moderate numbers of students were distracted by elements in the learning environment.</td>
</tr>
<tr>
<td></td>
<td>- In none of the classrooms observed were distractions kept to such a minimal level as to have no impact on students’ ability to focus on learning.</td>
</tr>
</tbody>
</table>
### SUPPORTING TEACHERS’ WORK

#### Table 5. (Continued)

School A1 (Non-improving) Quality of the Learning Environments Data Reduction Chart

<table>
<thead>
<tr>
<th>D3 Strengths</th>
<th>D3 Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disciplinary content</td>
<td>In 57.2% of classes observed, students could successfully complete the assigned task with little or no understanding of related major concepts, or theories central to the discipline.</td>
</tr>
<tr>
<td>Disciplinary processes and inquiry</td>
<td>In none of the classes observed were students engaged in high to moderate amounts of inquiry to discover new information relevant to topics studied.</td>
</tr>
<tr>
<td>Audience beyond school</td>
<td>In none of the classes observed were the products of learning presented to an audience beyond the class.</td>
</tr>
<tr>
<td>In 71.4% of classes, students presented the products of their learning to the teacher only.</td>
<td>In 28.6% of classes, students presented the products of their learning to another student within the class.</td>
</tr>
</tbody>
</table>

School A2 (Improving) Quality of Learning Environment Data Reduction Chart

<table>
<thead>
<tr>
<th>HOT vs. LOT</th>
<th>D3 Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOT vs. LOT</td>
<td>HOT vs. LOT</td>
</tr>
<tr>
<td>In 66% of classes observed, students were involved in moderate to high amounts of HOT.</td>
<td>HOT vs. LOT</td>
</tr>
<tr>
<td>Substantive conversation</td>
<td>In 33.4% of classes observed, students were engaged mostly or only in LOT.</td>
</tr>
<tr>
<td>In 66% of observations, students were involved in moderately substantive conversation.</td>
<td>Deep knowledge</td>
</tr>
<tr>
<td>Instructional resources</td>
<td>In 50% of classes observed, knowledge exploration was very thin, superficial, or fragmented.</td>
</tr>
<tr>
<td>Classes were well-equipped, with a wide range of instructional resources.</td>
<td>Substantive conversation</td>
</tr>
<tr>
<td>Instructional resources were in use by students in most of the classes.</td>
<td>None of the classes observed engaged all of the students in highly substantive conversation.</td>
</tr>
<tr>
<td>Classes are bright and cheerful with informational and motivational displays.</td>
<td>In 33% of classes observed, students were engaged in very little substantive conversation.</td>
</tr>
<tr>
<td>Student lessons in the computer lab are coordinated with content in the regular classroom.</td>
<td>Real world relevance</td>
</tr>
<tr>
<td>Student engagement</td>
<td>In 50% of classes observed, class activities were highly relevant to the real world beyond the school, and students made the connection.</td>
</tr>
<tr>
<td>In 83.3% of observations, student engagement, interest, and enthusiasm for learning activities was high or moderately high.</td>
<td>Student engagement</td>
</tr>
<tr>
<td>In 16.7% of the classes observed, most students participated and remained on-task with moderate amounts of interest and enthusiasm.</td>
<td></td>
</tr>
</tbody>
</table>

25
A remarkably consistent. Similar sets of differences in internal processes between matched
When the differences between pairs were examined across all three pairs, they were
improving schools function also emerged as a result of the cross-pair comparisons.

culture. Generalizations about patterns of differences in the ways staff at differentially
level of the school. In other words, in schools where student scores were improving,

this to address issues, share resources, solve problems, and plan pro-actively on the basis
of their students’ needs, the students learned more. A positive relationship was also
indicated between authentic pedagogy and student achievement aggregated at the
level of the school. In other words, in schools where student scores were improving,
the students were more likely to be involved in authentic learning tasks that were
interactive, cognitively complex, and valuable beyond school.

The results confirmed the existence and utility of the four dimensions of school
culture. Generalizations about patterns of differences in the ways staff at differentially
improving schools function also emerged as a result of the cross-pair comparisons. When
the differences between pairs were examined across all three pairs, they were
remarkably consistent. Similar sets of differences in internal processes between matched

Table 5. (Continued)

School A2 (Improving) Quality of Learning Environment Data Reduction Chart

<table>
<thead>
<tr>
<th>HOT vs. LOT</th>
<th>HOT vs. LOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distractions</td>
<td></td>
</tr>
<tr>
<td>In 50% of classes observed, distractions were kept to a minimal level.</td>
<td></td>
</tr>
<tr>
<td>Student organization of information</td>
<td></td>
</tr>
<tr>
<td>In 83.3% of classes observed, the extent to which students were asked to organize, synthesize, interpret, explain, or evaluate in their assignments/assessments was high.</td>
<td></td>
</tr>
<tr>
<td>Disciplinary processes and inquiry</td>
<td></td>
</tr>
<tr>
<td>In 66.7% of classes observed, students participated in some form of inquiry process, though not necessarily those central to the field of study.</td>
<td></td>
</tr>
<tr>
<td>Audience beyond school</td>
<td></td>
</tr>
<tr>
<td>In 66.7% of classes, students presented products of their learning to students within the class.</td>
<td></td>
</tr>
<tr>
<td>Distractions</td>
<td></td>
</tr>
<tr>
<td>In 16.7% of the classrooms, distractions were problematic and interfered with student learning.</td>
<td></td>
</tr>
<tr>
<td>Student organization of information</td>
<td></td>
</tr>
<tr>
<td>In 16.7% of classes observed, students were not asked to organize information in any substantial way.</td>
<td></td>
</tr>
<tr>
<td>Audience beyond school</td>
<td></td>
</tr>
<tr>
<td>In none of the classes observed were the products of learning presented to an audience beyond the school.</td>
<td></td>
</tr>
<tr>
<td>In 16.7% of classes, students presented the products of their learning to the teacher only.</td>
<td></td>
</tr>
</tbody>
</table>

does to help them. One very informative qualitative source for Dimension 4 were
the comments made by parents to open-ended questions. These data sources were
analyzed to complete the descriptions and the Data Reduction Charts for Dimension 4, the Student-Centered Focus. Some of the most striking differences in this pair, as
well as in the other two school pairs, were in parental involvement and efforts to offer
individualized assistance to students who were in need of greater support. Table 6 compares school norms in Dimension 4 of school culture.

INSIGHTS ABOUT STAFF, SCHOOLS, AND CHANGE

This study documented a strong relationship between the Professional Orientation of the
faculty and school improvement. This means that where teachers worked collaboratively
to address issues, share resources, solve problems, and plan pro-actively on the basis
of their students’ needs, the students learned more. A positive relationship was also
indicated between authentic pedagogy and student achievement aggregated at the
level of the school. In other words, in schools where student scores were improving,
the students were more likely to be involved in authentic learning tasks that were
interactive, cognitively complex, and valuable beyond school.

The results confirmed the existence and utility of the four dimensions of school
culture. Generalizations about patterns of differences in the ways staff at differentially
improving schools function also emerged as a result of the cross-pair comparisons. When
the differences between pairs were examined across all three pairs, they were
remarkably consistent. Similar sets of differences in internal processes between matched
improving and non-improving schools are listed by dimension in Table 7 (p. 29). While these generalized observations accurately summarize many operational factors that are socio-cultural in nature for the schools studied, caution should be taken in applying these generalizations to other settings, since they are based on a limited number of cases and may not hold true across all instances and contexts. They are nonetheless noteworthy and should be explored in greater depth in subsequent research.

Cultural change involves a complex chain of overlapping events that rarely occur sequentially. While the change process looks different at each school, a number of commonalities were observed among the schools studied, which led to the conclusion that the dimensions of culture seem to relate to each other in stable ways. Figure 1 (p. 31) illustrates the patterns of interrelationships that emerged between the dimensions of school culture. These relationships were constant across all cases studied. Arrows denote possible causal relationships. The catalyst for change in all schools was a desire for improved student achievement.

Table 6. Data Reduction Charts Dimension 4 – Pair C

School C1 (Non-improving) Student-Centered Focus Data Reduction Chart

<table>
<thead>
<tr>
<th>D4 Strengths</th>
<th>D4 Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Teachers and the principal genuinely care about the students.</td>
<td>– Efforts to individualize are inconsistent, not widely executed, and not systematically tracked for effectiveness.</td>
</tr>
<tr>
<td>– Teachers are conscientious and willing to adapt to the needs of a changed student population.</td>
<td>– There is little instructional differentiation based on student needs, abilities, experiences, or interests.</td>
</tr>
<tr>
<td>– Teachers recognize the need to individualize instruction for some students.</td>
<td>– There is no systematic plan for analyzing achievement and other data at the level of the individual student.</td>
</tr>
<tr>
<td>– Student academic recognition is frequent and emphasized.</td>
<td>– Parental involvement is low; there is little day-to-day participation, and even less input.</td>
</tr>
<tr>
<td>– There have been recent increases in community, corporate and interest group sponsorship.</td>
<td>– No innovative or out of the ordinary efforts are being made to involve more parents.</td>
</tr>
<tr>
<td>– Volunteer program needs more structure – training for volunteers, development of a schedule of routine tasks, establishment of routine work schedules, public recognition of parent/community volunteers.</td>
<td>– Increased funding is needed for staff development, sustained external support for change, and additional instructional resources for enhanced enrichment programs; grant writing or other alternative funding sources should be explored.</td>
</tr>
<tr>
<td>– New parent and counseling programs are needed to support the needs of working parents and gifted students.</td>
<td></td>
</tr>
</tbody>
</table>
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Table 6. (Continued)
School C2 (Improving) Student-Centered Focus Data Reduction Chart

<table>
<thead>
<tr>
<th>D4 Strengths</th>
<th>D4 Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>– The reorganization of the Parents, Teachers and Friends Club offers a genuine opportunity for more meaningful and substantial parental involvement.</td>
<td>– Efforts to individualize are inconsistent and not systematically tracked for effectiveness.</td>
</tr>
<tr>
<td>– The parent organization plans to offer paid childcare and meals for night meetings to increase parent attendance at meetings.</td>
<td>– There is a need for increased instructional differentiation, based on documented student needs, abilities, experiences, or interests.</td>
</tr>
<tr>
<td>– Students, their work, and their accomplishments are displayed throughout the school.</td>
<td>– Parents need more venues for input.</td>
</tr>
<tr>
<td>– Students are publicly recognized on a routine basis; this could be emphasized even more.</td>
<td>– Parent education needs to be offered more frequently and at times that allow working parents to participate.</td>
</tr>
<tr>
<td>– Teachers believe in and provide parent education.</td>
<td>– Volunteer program needs more structure – training for volunteers, development of a schedule of routine tasks, establishment of routine work schedules, public recognition of parent/community volunteers.</td>
</tr>
<tr>
<td>– Teachers recognize the need to individualize instruction.</td>
<td>– Greater community and corporate sponsorship is needed.</td>
</tr>
<tr>
<td>– The school has a process (HSAT) that allows teachers and the principal to systematically and collectively focus on insuring that the individual needs of struggling students are met.</td>
<td>– Increased funding is needed for staff development and planned enhancements.</td>
</tr>
<tr>
<td>– The school faculty has a strong commitment to making sure the child’s life circumstances support his chances for academic success.</td>
<td>– HSAT process could be expanded to assess the extent to which average and high-grade students are being challenged to reach their potential.</td>
</tr>
<tr>
<td></td>
<td>– Opportunities for meaningful student leadership need to be expanded.</td>
</tr>
</tbody>
</table>

Observations in this study indicated that change processes typically initiated with the principal in Dimension 2, the Organizational Structure. Factors in Dimension 2, such as the amount and type of leadership, as well as the amount of strategic planning, in turn, have a direct impact on both Dimension 1, the Professional Orientation, and Dimension 4, the Student-Centered Focus. The existing behavioral norms in Dimension 1 both impact and are impacted by Dimension 2. Dimension 1 also directly impacts Dimension 3, the Quality of the Learning Environments. Dimension 3 is impacted by norms and processes in Dimension 4.

The dimension that is impacted by more aspects of the culture than any other is Dimension 3, the Quality of the Learning Environments. It is believed that this dimension most directly impacts student achievement. Since Dimension 3 is impacted by the other three dimensions and it in turn has the most direct impact on student achievement, it can be thought of as a mediating effect resulting in large part from behavioral norms in the other three dimensions of school culture. It is advisable, therefore, that those wishing to improve the Quality of the Learning Environments at their school should begin by introducing changes into Dimension 2, the Organizational Structure, first,
**SUPPORTING TEACHERS’ WORK**

Table 7. Generalizations about Cultural Change at the School Level

<table>
<thead>
<tr>
<th>Dimension 1</th>
<th>Dimension 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Professional Orientation</strong></td>
<td><strong>Organizational Structure</strong></td>
</tr>
<tr>
<td>Motivated teachers make it happen; passive compliance kills meaningful change.</td>
<td>The principal is the gatekeeper; school change starts (or ends) with the principal.</td>
</tr>
<tr>
<td>A collective vision is essential.</td>
<td>Strong inspirational leadership is needed to motivate teachers and transform cultures.</td>
</tr>
<tr>
<td>Change requires increasing professional knowledge and skills for both teachers and school level administration.</td>
<td>School improvement requires detailed collaborative strategic planning and close monitoring of progress.</td>
</tr>
<tr>
<td>Teachers who reflect and personalize what the change means for the way they perform their work are more common at improving schools.</td>
<td>Sometimes change requires restructuring schedules and responsibilities; improving schools are more flexible and less rigid in their structures.</td>
</tr>
<tr>
<td>The social support that occurs with increased collegiality and a unified challenge is crucial to the motivation of teachers to persist with attempts to master more effective instructional practices.</td>
<td>Improving schools have effective in-school communication patterns.</td>
</tr>
<tr>
<td>Organizational change requires behavioral change of individual teachers according to a unified philosophy or strategy, consequently, schools with strong informal teacher instructional leadership to assist struggling teachers experience greater success with instructional improvements.</td>
<td>Successful schools find the time and money to do what is important.</td>
</tr>
<tr>
<td>In the process of improving schools, teachers felt more comfortable to learn new methods through trial and error as they were more resourceful; hence problem identification, experimentation, and evaluation should drive decision making.</td>
<td>Well-informed and flexible administrators who ask for teacher input regularly and listen to recommendations have faculties that are more likely to go along with what they ask.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension 3</th>
<th>Dimension 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quality of the Learning Environment</strong></td>
<td><strong>Student-Centered Focus</strong></td>
</tr>
<tr>
<td>Enthusiasm for learning is more common in improving schools.</td>
<td>Effective programs were more likely to be in place, and in use, to identify, meaningfully support, and monitor the achievement of subgroups and individuals at improving schools.</td>
</tr>
<tr>
<td>Thinking skills are emphasized across the curriculum in improving schools.</td>
<td>Improving schools monitor individual student achievement rigorously.</td>
</tr>
<tr>
<td>There is more interaction and student inquiry in improving schools.</td>
<td>Parents were more likely to be involved in meaningful ways at improving schools.</td>
</tr>
<tr>
<td>Improving schools and high performing schools are more likely to engage students in authentic learning tasks.</td>
<td>Improving schools were more accepting and accommodating of individual student differences.</td>
</tr>
<tr>
<td>Products of learning are more likely to be published/shared or used in authentic/real world ways with an audience beyond the school.</td>
<td>Improving schools were more likely to be involved in complex on-going tasks in the classroom that could not be completed in a day or two.</td>
</tr>
<tr>
<td>Teachers in improving schools were less likely to control student talk strictly but monitored student talk better to keep learners focused on the task at hand.</td>
<td>Higher performing schools tended to plan more holistically and integrate subjects/disciplines or assign projects that were evaluated in multiple subject areas.</td>
</tr>
<tr>
<td>Students in improving schools were more likely to be involved in complex on-going tasks in the classroom that could not be completed in a day or two.</td>
<td></td>
</tr>
</tbody>
</table>
followed by changes to Dimension 1, the Professional Orientation. This study indicates that this is the natural flow of events in the cultural change process.

Dimensions 1 and 3 most directly involve the majority of the day-to-day work of teachers. While teachers are frequently involved in all dimensions of school operations, Dimensions 1 and 3 include planning for instruction and the act of instruction, activities considered primary to the role of teacher, whereas Dimensions 2 and 4 can be thought of as school-level conditions that support the work of teachers in planning and teaching. Though teachers are usually somewhat involved in Dimensions 2 and 4, many of the core responsibilities in these areas are handled by other members of staff.

A key finding of this study was the interdependence of multiple aspects of operations within all schools regardless of improvement status or other tracked variables. For example, in all cases if a school was strong in Dimension 1; it was also at least moderately strong in Dimension 3, confirming the previously documented relationships between teacher planning and collegiality and better classroom learning experiences for students.

Another commonality observed in non-improving schools was an approach to school improvement that I call the layering-on approach. In these schools, rarely did the majority of the faculty seek or acquire in-depth knowledge of the philosophy behind their new program or initiative. Rarely did they show much interest in learning new methods associated with the program or bother to find out why changing the way they do things might help their students. Hence, teachers tended to simply layer the new (policies, programs, curricula, methods, materials) on top of the old ones, rather than genuinely change them.

Metaphorically speaking, this layering-on of the new atop the old can be likened to a cook with a pot of vegetable soup who decides to change the soup to cream of broccoli. Rather than starting from scratch and adding in the appropriate ingredients, the decision is made to simply add broccoli to the existing mix. When this fails to produce the desired effect, a cream sauce is also added to the mix. The result is a conglomerated mess. The appropriate course of action would, of course, be to change the recipe by first removing the old from the pot, then systematically adding back only the ingredients that will yield the desired result. However, few of the schools in this study comprehended this concept.

It is important that schools pursuing substantial improvements understand that change is not simply layering new programs on top of the existing culture and hoping for the best. Change involves taking a long hard look at the norms that define the way a school works, questioning why things are the way they are, and taking deliberate steps to bring the reality of the way things are done into alignment with a unified vision for the future. This means distinguishing the productive norms from the counterproductive. The process of eliminating counterproductive behavior and replacing it with productive behavior is a long, slow process involving a great deal of education, commitment, feedback, and support. Changing human behavior is always difficult, but with the right plan and much determination, it is entirely possible to transform school culture. The starting point is a well-informed principal who believes
in the change initiative, who can bring teachers on board and motivate them to assume a professional orientation in exploring this new initiative at a deep level to ascertain whether and how their students might benefit from it.

HOW CAN WE SUPPORT THE WORK OF TEACHERS?

While it is certainly not a new idea that the quality of students’ learning experiences in the classroom affects student achievement, accomplishing and sustaining higher quality learning experiences across entire schools has often proven elusive. This study helps us to put the classroom teacher into the context of the entire school and its operational norms. Teachers are people working in organizations. If we want them to make substantial alterations to their work, then school-level factors, such as a knowledgeable and supportive administration, time to plan, professional development, and interventions for struggling students, should be in place to support the teachers as they learn to approach their work in different ways. The following is a list of recommendations to support the work of teachers:

1. School-level and district-level administrators should be trained in new initiatives before expecting teachers to implement them.
2. Principals need to ensure that teachers have adequate professional development prior to implementation and on-going training related to new initiatives.
3. Teachers need to be provided with time for a regular common planning period, prior to implementation, to explore the initiative and its implications for instruction at a deep-level, so that incongruent practices can be recognized and addressed.
4. Teachers need to guide the implementation process collaboratively and develop mechanisms for monitoring success.

5. Instructional support and leadership should be available to all teachers and should involve individual and group reflection of teachers’ experiences in the classroom.

6. Principals and instructional leaders should develop a strong trusting rapport with teachers and be directly involved with teacher planning groups.

7. Teachers should identify a research-based observation instrument, such as the SAPI/A used in this study, and use it to provide peer feedback to one another.

8. Teachers should work regularly in teams, committees, or task forces.

9. The school should provide supplementary programs to support students and their families.

10. Teachers should be proactive in collectively communicating to administrators and parents about other supports they would like to have in place.

Caring and committed professional people change schools. The very best programs, policies, procedures, and plans are ineffective without the intentional efforts of dedicated teachers, administrators, and school staff. Cultural change in schools involves people changing the way they do things and possibly even rethinking their core beliefs about learning and the role of schools. This does not happen overnight; it is a gradual process. Individuals and groups of school staff must collectively evolve and create a different way of being and doing, a process which can take years to complete. However, this study reassures us that it is possible to plan for a better future for our students and to actually transform our schools into more effective places for students to learn.

Successful planned change requires much effort, and the frontline combatants, our teachers, are often our greatest casualties, receiving the blame for all failures. Teachers are but one part, although a very important one, of the equation of a successful school. Teachers charged with improving learning environments are, first and foremost, people being asked to change established behavior patterns in a complex environment. This can be difficult, tricky, and slightly scary. Teachers involved in a change initiative need support in a number of ways. This study demonstrated that at least three other dimensions of school culture impact classroom learning environments. The presence or absence of a strong supportive school culture can make the difference in whether or not our teachers’ efforts are fruitful in improving student learning in the classroom.

REFERENCES

SUPPORTING TEACHERS’ WORK

LA TEFY SCHOEN


2. EXTENDING TEACHERS’ WORK TO OUTDOOR LEARNING ENVIRONMENTS

Applying High-Quality Instruction for Meaningful Learning

The term “outdoor education,” which gradually emerged in the United States in the early to mid-1900’s, is associated with the use of natural and human-created areas as environments for learning. The term is interpreted in different ways and used to describe a variety of experiences, each of which focuses on specific goals. Such experiences include school sites, field studies, and resident experiences that address objectives of the school curriculum; camping experiences to enhance social and living skills; and environmental education experiences that focus on problems and issues associated with a quality environment. There are also adventure education programs that aim to develop self-concept, agility, and fitness, as well as programs that focus on an appreciation of nature, recreational pursuits, therapeutic programs for children and adults with disabilities, and the like.

This chapter focuses on outdoor education as it applies to teachers’ work, with particular emphasis on the use of the outdoor environment as an approach with which to achieve more efficient and effective learning of concepts, skills, and dispositions as they relate to the goals and objectives of the school curriculum. A model for high-quality instruction will be offered as a means for creating meaningful learning and extending teachers’ work to non-traditional settings.

OUTDOOR LEARNING ENVIRONMENTS

Unlike traditional classrooms, which are characterized by expository methods of instruction, outdoor environments provide countless opportunities for active learning of social, emotional, and academic objectives in a variety of subject areas through firsthand observation and experience. For example, many outdoor environments provide the settings for inquiry-based instruction. Exploring one’s environment, asking theoretical and operational questions, making observations, engaging in investigations and experimentation, collecting and analyzing data, drawing conclusions, making inferences, and formulating new questions are some of the exciting processes that are practiced through inquiry-based instruction. Outdoor education programs “encourage...
development of openness of thinking and cognitive flexibility by exposing participants to novel ideas, viewpoints, settings, activities, cultures, and diverse group members” (Neill, 2008, p. 87). Table 1 shows a number of created and natural environments that provide settings for learning beyond the classroom.

### Table 1. Environments for Learning

<table>
<thead>
<tr>
<th>Created (Built) Learning Environments</th>
<th>Natural Learning Environments</th>
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</thead>
<tbody>
<tr>
<td>Zoos and botanic gardens</td>
<td>Sea shores and tide pools</td>
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<tr>
<td>Museums</td>
<td>Ponds, lakes, and shorelines</td>
</tr>
<tr>
<td>Nature centers</td>
<td>River banks and stream-beds</td>
</tr>
<tr>
<td>Exploratoriums</td>
<td>Mountains</td>
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<tr>
<td>Aquariums, oceanariums, and planetariums</td>
<td>Valleys</td>
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<tr>
<td>Space centers</td>
<td>Deserts</td>
</tr>
<tr>
<td>Technology centers</td>
<td>Road cuts</td>
</tr>
<tr>
<td>Sites with bridges, dams, tunnels, and domes</td>
<td>Quarries</td>
</tr>
<tr>
<td>Amusement parks</td>
<td>Fields and forests</td>
</tr>
<tr>
<td>Manufacturing plants</td>
<td>Nature preserves</td>
</tr>
<tr>
<td>Weather stations</td>
<td>Rainforests</td>
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<tr>
<td>Airports</td>
<td>National, state, and local parks</td>
</tr>
<tr>
<td>TV and radio stations</td>
<td>Nature preserves</td>
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<tr>
<td>Government agencies</td>
<td>School sites</td>
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<tr>
<td>Cemeteries</td>
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<tr>
<td>Farms</td>
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<tr>
<td>Recycling centers</td>
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<tr>
<td>Water treatment facilities</td>
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<tr>
<td>Outdoor education centers</td>
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</table>

### A RATIONALE FOR TEACHING IN OUTDOOR LEARNING ENVIROMENTS

The philosophical roots of outdoor education date back to the 16th century, when Czech theologian and educator John Amos Comenius (1592–1670) professed a belief in the extraordinary power of method and the search for psychologically grounded principles of teaching. Comenius (1967, pp. 89, 91) noted:

In spring they may be taken into the garden or into the country, and may be taught the various species of plants, vying with one another to see who can recognize the greater number. ... Nothing, therefore, should be learned for its value at school, but for its use in life, that the information which a scholar has acquired may not vanish as soon he leaves school.

In the 18th century, French philosopher Jean-Jacques Rousseau (1712–1788) preached the importance of healthful physical activity in a child’s education. He professed the benefits of tapping into a child’s natural interests and curiosity and learning from direct
multi-sensory experience. Swiss educator Johann Heinrich Pestalozzi (1746–1827) taught practical skills through firsthand experience at his farm-home school for boys and girls. His approach to instruction was based on experiential learning, whereby experiences were later used to formulate generalizations and principles. Pestalozzi urged teachers to take students out of the classroom:

Lead your child out into nature, teach him on the hilltops and in the valleys. There he will listen better, and the sense of freedom will give him more strength to overcome difficulties. But, in these hours of freedom let him be taught by nature rather than by you. Let him fully realize that she is the real teacher and that you, with your art, do nothing more than walk quietly at her side (cited in Hammerman, Hammerman, & Hammerman, 2001, p. 225).

The approaches advocated by Comenius, Rousseau, Pestalozzi, and others during those early years offered a base of support for the learning methods in outdoor environments that would follow decades and even centuries later.

The American philosopher, psychologist, and educator John Dewey (1859–1952) was considered to be an acknowledged leader in American educational philosophy and served as the administrator of one of the first laboratory schools in the nation at the University of Chicago in 1886. During his tenure there, he authored two educational treatises: The School and Society in 1899 and The Child and the Curriculum in 1902 (Dewey, 1950; 1953). Dewey believed that experiences of all kinds should be included in the curriculum and that educators should know how to capitalize on a child’s physical, natural, and social surroundings in a way that would result in significant learning experiences. Dewey advocated an active learning environment that was closely linked to community activities and was focused on practical knowledge, both for immediate social use and for future use. These goals were part of the progressive education movement that many U.S. schools established and adopted in the early part of the 20th century. Dewey’s concern for a practical, socially responsible life was a key element of the philosophical concept of pragmatism that he explicated in many of his writings.

THE EVOLUTION OF OUTDOOR EDUCATION:
A BRIEF HISTORY

Prior to 1930, outdoor education took the form of isolated experiences including “nature study,” where science educators used field experiences in teacher education programs, and “camping education,” where school personnel began to show interest in the educational potential of summer camping experiences. In his dissertation research, Hammerman (1961) identified a series of periods after 1930 through which outdoor education evolved in the United States. These periods are summarized here in order to identify the major contributions to the field during the developmental years.

The Period of Inception (1930–1939) saw a major breakthrough for outdoor education due to widening recognition among educators of the educational values inherent in the summer camp experience. During this time, key leaders from such fields
as camping education, recreation, physical education, natural science, conservation, and social welfare offered varying points of view to the movement now known as outdoor education. The civic and social values of the camping experience were stressed, but few attempts were made to correlate the outdoor learning activities to the regular school curriculum.

The Period of Experimentation (1940–1952) saw the beginning of school-sponsored camping programs and national workshops that focused on the role of camping in America. Experimentation with out-of-classroom learning at school camps, gardens, farms, and forests indicated a desire to improve traditional education programs through new approaches. Experimental programs sponsored by city and county school districts, universities, and State Departments of Education were initiated in Michigan, New York, California, Ohio, Tennessee, Texas, and Washington. The impact of school camping during this period was characterized by curricula emphasizing conservation education, healthful living, meaningful work experience, socialization, group guidance, and democratic living. By the end of this period, most resident programs were operating during the academic year with a transition from recreational, camp-type programs toward a closer relationship to the existing school curriculum.

The Period of Standardization (1953–1964) was a time of significant growth and development for outdoor education. As early as the 1950’s, there was a gradual move away from the camping stereotype toward programs that were more closely related to the school curriculum. Terms such as “outdoor school” and “outdoor laboratory” came to replace the term “school camp.” Newly formed organizations contributed to the formulation of standards for outdoor education.

Significant contributions towards promoting the vision of outdoor education to enhance the core curriculum were made through organizations that were developed during this period. Among these organizations were the Outdoor Education Association, founded by L. B. Sharp in the early 1950’s; the California; the Association for Outdoor Education, established in 1954; and the National Outdoor Education Project, headed by Julian W. Smith in 1955.

Topics related to the use of the outdoors to expand teaching and learning were addressed at early conferences. For example, the first National Conference on Outdoor Education was held in Washington, D.C. in May, 1958, with others following shortly thereafter in Illinois and Michigan. Final sessions were devoted to two fundamental issues in outdoor education: teacher and leadership preparation and school programs in outdoor and school camp settings.

Linked to the growth of outdoor education was concern about preparing teachers to extend their work to the outdoors. The first National Conference on Outdoor Teacher Education was held at Northern Illinois University’s Lorado Taft Field Campus in September of 1960. The focus of the conference was to prepare teachers to carry suitable portions of the curriculum to the outdoors. Small group sessions were devoted to topics such as the values to be attained through outdoor education; building an outdoor education philosophy for college or university staff; the impact of outdoor
education on public schools, its curriculum, and its teachers; and the use of resource people in the program.

Materials such as handbooks and manuals were developed to guide teachers in planning for outdoor experiences, since the core curriculum was the focus for the programs of many schools. The efforts put forth by the organizations and pioneers in outdoor education paved the way for the tremendous expansion of organizations and networks that followed well into the 21st century.

The Period of Resurgence and Innovation (1965–1969) was a brief transitional phase during which program emphasis ranged from the development of outdoor recreational skills to ecological studies and from brief, local field experience to cross-country expeditions. The continuing impact of outdoor education on the school sector was reflected in the extensive literature that emerged during that time. An old theme in many outdoor education programs – human-kind’s relationship to the environment – gained new impetus during this period, while the relationship between outdoor education and environmental education was also recognized. The exploration of new horizons and expansion of program offerings were the dominant characteristics of the period.

The Period of New Directions (1970–1985) saw the expansion of organizations and numerous sponsored conferences for leaders in outdoor education. The resurgence of interest in using the outdoors as a laboratory for learning and the creation of innovative applications of the concept of outdoor education during the previous period led to an expanding sphere of influence as new directions became established in educational practice. Environmental education became the thrust of many outdoor education programs in the new decade. Adventure education geared towards older youths and young adults emerged as an experience of self-discovery, with the claim that individuals who experience self-discovery, in the wild can transfer lessons of self-awareness, respect for others, and environmental concerns to other aspects of life. The significant trend during this period was the growing effort to network with the variety of agencies, organizations, and associations involved with education in, for, and about the natural environment.

The Period of Diversity and Networking (1986–present) continues to expand and nurture the diversification that characterized the previous period. The spectrum of outdoor education has broadened to include an array of new and innovative programs and approaches to learning, including cultural journalism, urban ecology, adventure education, challenge courses for youth-at-risk, and environmental education, as well as an extension of the school curriculum. The growing diversity and new trends in outdoor education are reflected in the numerous publications during this period. Such contemporary factors as heightened awareness of the environmental degradation of the Earth, social conditions of inner cities, and problems of youth-at-risk coupled with mediocre academic performance on international standardized tests have prompted educators to seriously consider the benefits of using the outdoors as a context for meaningful learning.
THE IMPACT OF ORGANIZATIONS AND NETWORKS
ON PROFESSIONAL DEVELOPMENT

The 1990’s saw a dramatic increase in the number of conferences devoted to the impact of experiential and adventure education programs on participants of all ages. Teacher education and professional development efforts were expanded through the many conferences offered by professional organizations that emerged during this period. Annual conferences were held by the American Alliance for Health, Physical Education, Recreation, and Dance; the American Camping Association; the Association for Experiential Education; the Association of Nature Center Administrators; the Council of Outdoor Educators of Ontario; the Coalition for Education in the Outdoors; the Wilderness Education Association, and many others. State organizations numbered in the thousands.

Several networks of agencies, organizations, institutions, centers, and businesses were established that joined forces to support the broad aims of educating in, for, and about the outdoors. Among these was the Coalition for Education in the Outdoors, which is housed at the State University of New York at Cortland and publishes a journal called Taproot. This journal features outdoor and environmental news and reviews, research information, a comprehensive list of resources, professional opportunities, and more. Information is available on the web-site maintained by the Coalition for Education in the Outdoors.

The Institute for Global Communications (IGC) has played a formative role in bringing advanced communications technologies to grass-roots organizations around the world that are working for environmental sustainability. EcoNet, billed as the computer network for the planet, is an example of the impact of telecommunications on the broad field of outdoor/environmental education. Its users are able to communicate with individuals and organizations throughout the world. EcoNet has established partnerships with similar networks in Australia, Brazil, Canada, England, Japan, Nicaragua, Russia, Sweden, and Zimbabwe.

RESEARCH SUPPORT FOR OUTDOOR EDUCATION:
TEACHING AND LEARNING

Throughout the Period of Diversity and Networking, it was becoming increasingly difficult for scholars and practitioners to define the term “outdoor education” due to the variety of educational goals, teaching methods, and the diversity of learning environments listed under the heading of outdoor education. Researchers and educators created models to explain the relationships that exist between outdoor experiential learning methods. One such model, offered by Julian Smith, used the term “umbrella” as a metaphor and included terms such as camping education, outdoor education, earth education, environmental education, wilderness education, and experiential education. As the period expanded, additional terms were added to reflect new trends and approaches.
A number of research efforts relate directly to the use of outdoor environments for the purpose of extending teachers’ work to enhance the school instructional programs and increase learning. Studies that were designed around student involvement in school camping programs and outdoor education experiences were reviewed.

As early as 1947, L. B. Sharp was involved in an experiment undertaken by the Board of Education of the City of New York. A small-scale design was developed around the involvement of fifth and seventh-grade students in a three-week resident outdoor education program. One of the major questions explored in the research project was: Is educational camping an effective medium for meeting the objectives of education? A wide variety of tests and other measurement techniques were used on a pre/post-test basis that provided objective, semi-objective, and clinical data. Statistically significant gains favored the experimental group in two areas: interest at the fifth-grade level and vocabulary at the seventh-grade level. The experimental group also displayed gains in written expression, increased visual impressions, and artistic ability. The implications from the data were that the experimental groups benefitted in ways that would not have been possible in indoor classroom programs.

Cragg (1953) attempted to determine how the development of sixth-grade campers compared to that of non-campers and also to appraise the educational achievements of the camp program in terms of addressing the educational objectives identified by the school. The four areas of development Cragg measured were intellectual development, physical health, social relationships, and emotional development. She concluded that some definite contributions had been made to the educational development of students, most notably in intellectual development. The camp group showed a greater improvement in nature study than students who remained in the classroom. Another notable finding was that the camping experience produced a strong emotional impact in the joy and enthusiasm expressed by the children.

Hollenbeck’s (1958) doctoral dissertation studied the educational outcomes of a school camping program. Part of the study involved analyzing pre and post-camp interest inventories. She found that fifth-grade children made significant gains in science interests and fifth-grade boys showed gains in the eight areas of the inventory: art, music, social studies, active play, quiet play, manual arts, home arts, and science.

In 1982, the Orange County (California) Department of Education gathered data on the longitudinal impact of the resident school program on sixth-grade students six years after their participation during the 1975–1976 school year. Around one tenth (13%, i.e., 449 students) responded to a survey pertaining to 10 key areas of potential impact. Some of the key findings were:

- More than half of the students indicated that their interest in the natural sciences increased because of the outdoor school experience.
- Appreciation for the environment increased in 80 percent of the students.
- Approximately three quarters (77%) of the students indicated increased positive feelings about conservation and preservation of wilderness and national forest areas.
Three categories of personal relationships were impacted in a positive way: closer peer-to-peer positive attitude, cabin leaders as positive role models, and to a minimal extent willingness to accept responsibilities at home as a result of sharing responsibilities at the outdoor school (Hammerman et al., 2001, pp. 204–205).

The State Education and Environment Roundtable (SEER) is a cooperative endeavor of education agencies from 12 states that works to improve student learning by integrating the environment into K–12 curricula and school reform efforts. The members of SEER were interested in the potential of environment-based education programs to improve student learning, change traditional pedagogical paradigms, and influence the way children learn to live successfully in the world around them. With this in mind, they designed a study to identify and describe innovative and successful programs, and analyzed the similarities and differences among them. Other goals were to identify factors that contributed to the success of the programs and the challenges they faced during implementation.

SEER used the term Environment as an Integrating Context (EIC) for learning to define a framework for interdisciplinary, collaborative, student-centered, hands-on, and engaged learning that they believed should form the foundation of environment-based education in America’s schools. The EIC-based programs use the environment as a comprehensive focus for learning in the following areas: general and disciplinary knowledge, thinking and problem-solving skills, basic life skills, and understanding one’s relationship with the environment – community and natural surroundings.

Evidence gathered from site visits, interviews, and surveys, as well as gains on standardized test scores and grade-point averages from over 60 schools, indicated that students learn more effectively within an environment-based context than within a traditional educational framework. The academic benefits of an EIC-based program included better performance on standardized measures of academic achievement in reading, writing, math, science, and social studies. In addition, benefits were observed in the form of reduced discipline and classroom management, increased engagement and enthusiasm for learning, and greater pride in and ownership of accomplishments. The study concluded that the EIC educational framework significantly improves student performance throughout the curriculum and enriches the overall school experience.

The American Institutes for Research conducted an evaluation to measure the impact of week-long residential outdoor education programs for at-risk sixth-grade students in California (Effects of Outdoor Education Programs for Children in California, 2005, pp. iii–vi). The study involved 255 students from four elementary schools who attended three outdoor education programs (outdoor science schools) during a three-month period. The study was designed to compare a treatment group with a control group in order to address the following research questions:

1. How does participation in outdoor education programs impact students’ personal and social skills?

2. How does participation in outdoor education programs foster students’ stewardship of the environment and appreciation of the importance of the wise use of natural resources?
3. How does the science instruction received through the outdoor program increase students’ knowledge and understanding of science concepts?

Quantitative and qualitative data was collected from three rounds of surveys from students and two rounds from parents and teachers, site visits, and interviews. An overview of the study’s findings is presented below:

1. **Social and personal skills.** Students and parents were surveyed in order to measure changes across five constructs: conflict resolution, self-esteem, cooperation, leadership, and relationship with a teacher. Teachers rated each student on eight constructs: self-esteem, cooperation, conflict resolution, leadership, relationship with peers, problem solving, motivation to learn, and behavior in class. Teacher ratings provided evidence of a wide range of positive outcomes in social and personal skills related to participation in the outdoor science school. Children who attended the program showed significantly larger gains than the control group in six of the eight constructs.

2. **Knowledge and understanding of science concepts.** Children who attended the outdoor school program significantly raised their science test scores by 27 percent, as measured by a pre-post survey conducted upon their return to school. The increase in science knowledge was maintained six to 10 weeks after participation with no significant loss in science scores.

**A Review of Research on Outdoor Learning,** commissioned by the National Foundation for Educational Research (NFER), was conducted in response to the growing concern that opportunities for outdoor learning for students in England had decreased substantially in recent years (Rickinson, Dillon, Teamey, Morris, Choi, Sanders, & Benefield, 2004, pp. 5–8). The review critically examined 150 research studies on outdoor learning published in England between 1993 and 2003. Three major types of outdoor learning were studied with primary and secondary students as well as undergraduate learners: field work and outdoor visits, outdoor adventure education, and school grounds/community projects. Research findings related to teachers’ work and findings that influence practice are highlighted here:

1. **Impact of fieldwork and visits.** The study found substantial evidence to indicate that fieldwork that is well conceived, adequately planned, well taught, and effectively followed up provides opportunities for students to develop knowledge and skills in ways that enhance classroom experiences. The study also concluded that poor fieldwork is likely to lead to poor learning and that fieldwork can have a positive impact on long-term memory, due to the nature of the setting, and can lead to an improvement in social skills. In addition, the researchers reported that “there can be a reinforcement between the affective and the cognitive, with each influencing the other and providing a bridge to higher order learning” (Rickinson et al., 2004, p. 5).

2. **The impact of outdoor adventure activities.** Evidence suggests that the impact of outdoor adventure programs is greater on attitudes, beliefs and self-perceptions, and interpersonal and social skills than it is on cognitive and physical/behavioral benefits. However, when outdoor adventure programs focused on cognitive and
physical/behavioral measures, benefits were observed in the development of academic skills and improved engagement and achievement. Positive behavior was also promoted, as was improved self-image and fitness.

3. The impact of school grounds and community projects. Among the benefits related to the impact of school grounds and community projects were positive gains in science process skills and improved understanding of design and technology-related issues. With regard to the affective domain, the impact of learning in school grounds and community settings included greater confidence, renewed pride in community, stronger motivation to learn, and a greater sense of belonging and responsibility. The settings also had a positive impact on social development and relationships with peers, teachers, and the community.

With regard to thoughtful planning, the study suggests a number of factors that influence learning in outdoor settings and should be considered when thinking about how the quality and depth of outdoor learning might be improved. These factors include: program factors such as structure, duration, and pedagogy; participant factors such as characteristics, interests, and preferences of learners; and factors related to the nature and novelty of the setting.

IMPLICATIONS OF RESEARCH ON TEACHERS’ WORK

Two of the many contributions of educational research are that, firstly, it raises new questions and, secondly, it identifies various approaches for teachers to consider as they work toward improving teaching and learning. Positive research findings support and justify curricular approaches that extend beyond traditional models to more student and community-centered models that result in more meaningful learning. The findings from past and recent research studies in outdoor education offer valuable insights into teaching and learning that can and should influence what teachers do and how they do it.

Among the implications for practice that the studies identified are the importance of high quality and meaningful instruction and formative assessment to guide effective learning in outdoor settings. Curriculum and goal-based planning, implementation of thoughtfully designed activities and experiences, follow-up reflection on and application of learning, and ongoing assessments to monitor and guide the learning process are components of a model for high-quality teaching and learning that will be the focus of the next section.

DEFINING HIGH-QUALITY INSTRUCTION

High-quality instruction has been the focus of research and a topic of discussion. Four resources that offer overlapping and consistent descriptions of what is “high quality” provide useful information for operationally defining high-quality and meaningful instruction.

I. Carol Tomlinson (1999; 2004) offered indicators of high-quality instruction as they relate to academic diversity. She identified factors that assist teachers in providing
for diverse populations of students. Among the indicators of high-quality curriculum and instruction are the following:

- There is a focus on essential knowledge, understanding, and skills valued by professionals in the field.
- Curriculum and instruction are organized, unified, and sensible to the student.
- Student misconceptions are addressed.
- Instruction enables students to participate in respectful work.
- Students are able to use the learning in important ways.
- Instruction includes cognition and metacognition.
- Instruction and assessment are inseparable.
- Students generate knowledge.

II. In the study entitled *Looking Inside the Classroom: A Study of K–12 Mathematics and Science Education in the United States*, researchers observed more than 350 mathematics and science lessons and rated them on lesson design, lesson implementation, content addressed, and classroom culture (Weiss, Pasley, Smith, Banilower, & Heck, 2003). Assessment levels ranged from Level 1: Ineffective Instruction (passive learning and activity for activity’s sake) to Level 5: Exemplary Instruction. Based on the observers’ judgments, only 15 percent of the lessons were considered to be of high quality, while 27 percent were rated medium, and 59 percent were considered to be of low quality. Findings at the middle-school level were even more surprising. Only seven percent of science lessons were rated high, while 78 percent were rated low. Such findings send an important message about what teachers teach and, more importantly, how they teach.

Although the study viewed high-quality lessons in the context of mathematics and science, the indicators of effective lessons are relevant to all areas of the curriculum. These indicators are as follows:

- Engage students with worthwhile (mathematics/science) content.
- Create an environment that is conducive to learning.
- Ensure access for all students.
- Use questioning to monitor and promote understanding.
- Help students make sense of the (mathematics/science) content they are learning.

The research also reported that although teachers seem to know and be comfortable with the content of their lessons, their classrooms fell short of providing high-quality mathematics and science education for all students. Intellectual rigor, opportunities for creating meaning, and good use of questions for the development of concepts and skills are just a few of the important components that were found to be missing from classroom instruction.

According to the study, implications for professional development are as follows: Given that both content and methods are linked to student achievement, professional development programs must target goals to improve both the knowledge base of teachers and the skills of their discipline. Confidence and efficacy are needed in order to develop and maintain learning-centered environments.
III. James Stronge (2002) defined effective teaching as a product of good classroom management, organization, effective planning, and a teacher’s personal characteristics. He pointed to the importance of the presentation of material and the student’s ability to make authentic connections to it. He also identified the following behaviors of effective teachers:

- Use of student questions to guide lessons;
- Use of strategies to promote higher-order thinking;
- Use of a variety of activities and strategies to engage students;
- Monitoring of student engagement in all activities;
- Maintaining a student-centered classroom;
- Providing feedback;
- Designing assignments based on objectives; and
- Implementing elements of effective lessons.

The research-based indicators of effective teaching provide a framework for high-quality instruction that addresses the content standards for which teachers are held accountable and for the provision of a rich program of activities and experiences to maximize learning. Therefore, the indicators of high quality are powerful resources for the work that teachers do. They inform the design or modification of instructional materials – units of instruction and the activities and experiences that encompass it – that may be used to guide the teaching and learning process.

IV. Hammerman (2006a) used a review of national standards documents, literature, and research on effective teaching to identify eight indicators of high-quality teaching, in order to guide the development of curriculum and instructional processes. The review found that high-quality instructional programs:

- address clear and appropriate learning goals,
- build concepts and principles, develop skills, and practice dispositions valued by the scientific community,
- accommodate diversity through a meaningful context,
- include a variety of methods in a stimulating environment that engage and challenge students intellectually with attention to prior learning, misconceptions, and new learning,
- embed strategies that allow students to develop new or modified thinking frames (conceptual change) with links to their own lives, technology, and issues relevant to their community, state, nation, and world,
- develop thinking and problem-solving skills by using questioning, reflection, applications, graphic organizers, and other strategies that help students to make sense of what they are learning,
- incorporate a well-designed assessment system to monitor and guide the learning process and to provide frequent feedback to students about their learning, and
- utilize equipment, materials, and resources to enhance learning and provide a challenging learning environment.
MAKING INSTRUCTION MEANINGFUL

Every teacher is an instructional designer who makes hundreds of decisions related to classroom practices, activities, experiences, materials, and resources. Teachers have access to thousands of instructional activities and commercial products, as well as an endless supply of books, websites, and resources to support teaching and learning. Nevertheless, their efforts often fall short of expectations for high student achievement. The mere availability of instructional materials is not enough to ensure student success. The quality of the lessons that guide the teaching and learning process is a key factor in increasing student achievement.

In order for learning to be meaningful, it must incorporate new information into existing mental frames that comprise the learners’ prior knowledge and experiences. Learning is meaningful when it builds on what is known and deepens learners’ understanding of concepts by taking them to higher levels of cognition. Meaningful learning is often associated with engaged learning, in which students are actively involved in the instructional process and knowledge is processed and constructed through discussion, debate, mapping, and thinking.

Much has been written about how brain research can inform and guide more effective teaching and learning. Jensen (2000, p. 12) described the extraordinary potential of the human brain and its capacity for learning as follows:

The brain simultaneously operates on many levels of consciousness, processing all at once a world of colors, movements, emotions, shapes, smells, sounds, tastes, feelings and more. It assembles patterns, composes meaning, and sorts daily life experience from an extraordinary number of clues. It is so efficient at processing information that nothing in the living or man-made world comes close to matching human learning potential.

Jensen expressed the concern that teaching in a “linear, structured and predictable fashion” inhibits the brain’s learning ability and bores and/or frustrates learners.

Within the 12 brain/mind learning principles presented by Caine and Caine (1997), there is a strong emphasis on the ways the brain seeks and creates meaning. Caine and Caine defined meaningful learning as that which includes both deep and felt meaning. They described deep meaning as “whatever drives us and governs our sense of purpose. It includes all the instincts embedded in our reptilian brain, from survival and territoriality to nesting and flocking. It includes needs for social relationships and an emotionally rich life. And it includes our [...] intellectual and spiritual needs” (ibid., p. 111). Felt meaning is defined as the “coming together of thoughts and ideas and senses and impressions and emotions, something like a chemical reaction” (ibid., p. 113). Therefore, understanding results from the integration of thought with emotion.

Table 2 shows a stark contrast between traditional approaches and student-centered instruction. Statements related to teacher behaviors, students as learners, and the nature of student work are not unlike those described in the literature on engaged learning or observed in classrooms. The indicators provide two lenses through which instruction can be viewed and assessed: Traditional and Student-Centered.
### Table 2. A Comparison between Traditional Instruction and Student-Centered Instruction (Modified from Hammerman, 2006b)

<table>
<thead>
<tr>
<th>Traditional Instruction Teacher Behaviors</th>
<th>Student-Centered Instruction Teacher Behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Expository method dominates; “teach is tell” mentality; test preparation is a major focus</td>
<td>– Uses a variety of methods and strategies to address goals and standards</td>
</tr>
<tr>
<td>– Directs all activities for students; uses a “cook book” – one-right-answer approach</td>
<td>– Allows students to ask questions and design activities; includes problem, project, and inquiry-based learning; mediates and monitors learning</td>
</tr>
<tr>
<td>– Tells students what they will learn; explains the concepts and relationships; assesses knowledge through weekly tests</td>
<td>– Facilitates student thinking; allows students to explain concepts; uses “wait time”; provides frequent feedback</td>
</tr>
<tr>
<td>– Uses same content every year</td>
<td>– Learns with students; revises content/approach</td>
</tr>
<tr>
<td>– Uses text for content and verification of concepts</td>
<td>– Uses a variety of resources; provides contexts for learning that are relevant and meaningful</td>
</tr>
<tr>
<td>– Instruction focused on “right” answers with minimal relevance or application to real world</td>
<td>– Instruction guides students to concept development and applications to lives, community, world</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student as a Learner</th>
<th>Student as a Learner</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Listens to lectures and/or takes notes from video or power point presentations</td>
<td>– Builds understanding through engaged learning and inquiry-based activities</td>
</tr>
<tr>
<td>– Memorizes terms and facts from text; answers questions at the end of chapters</td>
<td>– Processes information for meaning through analyzing data, reflective questioning, and using terms and facts to communicate understanding</td>
</tr>
<tr>
<td>– Follows teacher or worksheet directions with little or no opportunity to deviate</td>
<td>– Has opportunities to design activities or investigations and conduct research to answer questions</td>
</tr>
<tr>
<td>– Regards teacher as authority</td>
<td>– Shares responsibility for learning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nature of Student Work – Prescribed</th>
<th>Nature of Student Work – Varied</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Emphasis on notes and worksheets or end of chapter questions</td>
<td>– Emphasis on research, investigations, data, and meaning; students have choices and opportunities to work collaboratively</td>
</tr>
<tr>
<td>– All students complete the same tasks and answer the same questions</td>
<td>– Tasks vary; investigations and experiences are “real world” with emphasis on data and/or research</td>
</tr>
<tr>
<td>– Teacher directs all tasks</td>
<td>– Teacher and students direct instruction and share responsibility for learning</td>
</tr>
<tr>
<td>– Shows little/no thinking or reasoning, problem solving, or explanations</td>
<td>– Shows evidence of thinking, reasoning, problem solving, and/or explanations</td>
</tr>
<tr>
<td>– Little/no use of visuals to show understanding or relationships</td>
<td>– Uses visuals and/or graphic organizers to show understanding and relationships between concepts</td>
</tr>
</tbody>
</table>
EXTENDING TEACHERS’ WORK TO OUTDOOR LEARNING ENVIRONMENTS

EXTENDING TEACHERS’ WORK TOWARD MEANINGFUL INSTRUCTION IN THE OUTDOORS

Outdoors as a Climate for Learning

Researchers have identified the need to provide rich and relaxed environments for learning to occur. Outdoor environments provide a climate similar to what Caine and Caine (1997) called “relaxed alertness” (low threat and high challenge) where students can be free to investigate and explore and/or be inspired and create without the barriers to learning that are often found in the classroom.

Diamond and Hopson (1998) defined an enriched environment for learning as one that:

– is free of stress and pressure,
– provides positive emotional support,
– ensures a nutritious diet,
– provides social interaction, and
– presents opportunities for sensory stimulation through active participation in appropriately challenging activities.

Outdoor environments provide novel and stimulating settings for active participation and sensory stimulation, which are often missing in traditional classroom settings. Through outdoor education experiences, teachers encourage thinking and cognitive flexibility by exposing students to novel ideas, viewpoints, settings, activities, cultures, and diverse group members.

A Model for Student-Centered Instruction

High-quality instruction results through thoughtful planning. Consideration must be given to a variety of important components that comprise a well-developed “blueprint” for instruction. High-quality lessons:

– focus on important concepts and principles, skills, and dispositions,
– provide a context for learning that is interesting and meaningful for students,
– involve numerous investigations and firsthand experiences that follow a learning-cycle model, address misconceptions, and use a variety of tools and technologies to engage learners,
– provide opportunities for students to investigate and explore, collect and record data, develop skills, and/or create products, reflect on experiences, make sense of experiences, and frame knowledge,
– provide frequent interactions between students and teacher, develop critical and creative thinking, formulate thought, and develop a deep understanding of concepts,
– link learning to the lives of students, technology, careers, community, state, national, and world issues, and other subject areas, and
– use a variety of formative assessments for providing feedback and monitoring learning.
Applying the Model to Outdoor Environments

Outdoor environments provide teachers with opportunities to extend their work by applying a wide range of instructional methods and strategies. Such environments are especially suited to multi-sensory experiences and investigations that provide challenges and deepen students’ understanding of natural phenomena. Students can assume any number of roles and responsibilities, regardless of whether they are investigating their school grounds or visiting informal science centers. Out-of-school experiences are exciting for students, especially if they have not previously had such opportunities.

Learning is the dynamic process of shaping and reshaping thoughts based on new knowledge and experiences. It is the creative, on-going synthesis of observations, reflections, and information about the physical and social worlds. The process of inquiry defines the context and processes that enable the knower to craft understanding. Inquiry is the careful, on-going questioning of our understanding of the world around us; it is a dynamic, creative endeavor filled with wonder and surprise.

The ability to apply inquiry as a method of teaching is one of the major advantages of teaching in the outdoors. The stimulating environments provide an abundance of living and non-living things with which to engage students in active learning. As a multifaceted method of instruction, inquiry provides opportunities for students to:

- make observations,
- pose questions,
- access and use relevant information,
- plan and carry out data-rich investigations,
- use tools and technologies to collect, analyze, and interpret data,
- propose predictions, answers, and explanations,
- communicate, and
- apply and develop critical thinking, logic, and reasoning skills.

IMPLICATIONS AND CONCLUSIONS

Inquiry and Problem Solving in an Outdoor Laboratory

Inquiry Approach

Inquiry embodies elements of other approaches to learning, such as discovery learning, the exploratory approach, and the leading-question technique. The one basic aim of the inquiry approach is to involve learners in and with experience to the extent that they are able to formulate their own questions and deepen their understanding of concepts and the relationships among concepts. The following is an example of an inquiry-based experience linked to standards and objectives that are common to a middle-school science curriculum.

As an introduction to a unit on energy transfer in living systems, students are able to assume the role of a naturalist and explore the school grounds or a nearby park to
discover a variety of habitats for local animals. The experience provides them with the following opportunities:

- Make careful observations and map the locations of habitats;
- Describe the habitats for birds, insects, squirrels, and other animals in detail;
- Look for evidence of food at or near the habitat (i.e., observe animals feeding, nut shells near a habitat, or stored food near a site) and infer the diet of local animals;
- Use data that they and other groups have collected to create food chains and food webs; and
- Apply their learning to the exploration of new environments.

**Problem-Solving Approach**

Students have an endless supply of questions about the natural environment. A problem solving approach can be used to motivate students to uncover and discover the processes, cycles, and patterns found in the natural world. When teachers encourage students to ask operational questions (i.e., questions that can be answered by investigating), they are setting the stage for active learning to occur. Problems may take the form of why or how something occurs, what will happen in certain circumstances, what effect does a human-created or natural disaster have on animals, plants, humans, the environment, and other forms. As students investigate problems, teachers are free to facilitate and monitor the learning process.

**Investigating in Informal and Outdoor Environments**

Table 3 provides a list of instructional activities for informal centers and outdoor settings. Although the list is by no means complete, it offers a vision for enhancing learning outside the classroom.

**Extending Teachers’ Work to Outdoor Settings**

Through carefully planned and implemented instruction, teachers are able to assume the role of facilitators of learning. In this role, teachers are free to interact with students in small groups or to individually affirm or correct their work, listen to their ideas and explanations, and make sure they are not misinterpreting or misunderstanding concepts or processes. Interaction with students enables teachers to ask higher-level questions, share their thinking with students, and guide them toward successful learning. As a bonus, teachers and students can capitalize on the “teachable moment” as new, exciting, and unexpected opportunities arise.

Following investigations, teacher or student-led discussions may focus on student experience, data and/or products, and conclusions related to the inquiry questions and investigations. Students should not be left on their own to interpret data and experiences, as misconceptions may arise. By asking thoughtful questions, teachers
## Table 3. Instructional Activities for Informal Centers and Outdoor Settings

<table>
<thead>
<tr>
<th>Outdoor and Informal Learning Environments</th>
<th>Sample Engaged Learning Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zoo, aquarium, aviary</strong></td>
<td>Investigate animal habitats</td>
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<tr>
<td></td>
<td>Discover food chains for animals</td>
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<tr>
<td></td>
<td>Observe exhibits and performances to determine characteristics of animals and their abilities to “perform”</td>
</tr>
<tr>
<td>Amusement parks</td>
<td>Investigate forces and motion in roller coasters and other rides</td>
</tr>
<tr>
<td></td>
<td>Observe and investigate potential energy and kinetic energy, Newton’s Laws of Motion, simple machines, speed and acceleration, gravity, and other concepts firsthand</td>
</tr>
<tr>
<td>Natural science museums and displays</td>
<td>Observe specimens and models</td>
</tr>
<tr>
<td></td>
<td>Learn about artifacts that relate to science content</td>
</tr>
<tr>
<td></td>
<td>Interact with specimens, such as rocks and minerals, animal skulls, pelts, fossils, plants and others</td>
</tr>
<tr>
<td></td>
<td>Identify the characteristics of natural materials and artifacts</td>
</tr>
<tr>
<td>School-sites, parks, cemeteries, botanic gardens, weather stations, water treatment facilities, outdoor education centers, nature centers, recycling centers, and other informal science centers</td>
<td>Follow self-guided trails that lead to native specimens and natural phenomena</td>
</tr>
<tr>
<td></td>
<td>Observe a variety of plants and animals to identify unique features of organisms; observe similarities and differences</td>
</tr>
<tr>
<td></td>
<td>Attend performances and video presentations and create graphic organizers to show concepts and relationships between concepts</td>
</tr>
<tr>
<td></td>
<td>Engage in firsthand observation and activities, such as hunting for fossils, observing or collecting rocks, investigating cemeteries, planting trees, collecting sap to make maple syrup, investigating a variety of natural phenomena in fields and forests, ponds, lakes, or rivers, mapmaking, orienteering, creative writing, drawing</td>
</tr>
<tr>
<td></td>
<td>Observe rock outcrops and geologic features of the landscape</td>
</tr>
<tr>
<td></td>
<td>Follow stream beds to learn about weathering, erosion, and deposition</td>
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<tr>
<td></td>
<td>Study the historical markers, epitaphs, and grave stones in a cemetery</td>
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<tr>
<td></td>
<td>Observe the use of technology for identifying weather patterns and conditions</td>
</tr>
<tr>
<td></td>
<td>Identify problems and issues that arise due to weather-related forces and factors</td>
</tr>
<tr>
<td></td>
<td>Investigate sources of fresh water and the ways water is treated for human consumption</td>
</tr>
<tr>
<td></td>
<td>Identify problems and issues related to the availability of fresh water</td>
</tr>
<tr>
<td>Technology centers</td>
<td>Observe the role of technology for enhancing data collection and measurement and use in visual displays</td>
</tr>
<tr>
<td></td>
<td>Observe technological design</td>
</tr>
<tr>
<td></td>
<td>Study relationships between structure and function in technology</td>
</tr>
<tr>
<td></td>
<td>Use the tools of technology to solve problems and extend learning</td>
</tr>
<tr>
<td></td>
<td>Identify strengths and limitations to technology</td>
</tr>
<tr>
<td></td>
<td>Identify “trade-offs” in the use of technology for solving problems</td>
</tr>
<tr>
<td>Outdoor structures, such as bridges, tunnels, dams, skyscrapers, and domes</td>
<td>Identify natural materials used in building structures</td>
</tr>
<tr>
<td></td>
<td>Study the technological designs and the forces of compression and tension in bridges and domes</td>
</tr>
<tr>
<td></td>
<td>Study the shape and construction of: tunnels for bearing weight, dams for controlling the flow of water, and skyscrapers for dealing with forces of weight, wind, earthquakes, and others</td>
</tr>
</tbody>
</table>
help students reflect on their experiences, make sense of their work, connect learning to prior knowledge to build deeper conceptual understanding, and create meaning through applications to their lives, technology, and/or society.

REFERENCES


