TRANSFORMATIONAL LEADERSHIP AND INFORMATION TECHNOLOGY: IMPLICATIONS FOR SECONDARY SCHOOL LEADERS

SELBY NOSEWORTHY

Transformational Leadership and Information Technology: Implications for Secondary School Leaders

by

Selby Noseworthy

A folio presented to the School
of Graduate Studies in partial
fulfillment of the requirements for
the degree of Master of Education

Department of Educational Leadership

Memorial University of Newfoundland

1998

St. John's   Newfoundland

Canada

ABSTRACT

The role of leadership in schools has always elicited much debate in academia. For the past two decades, critics and scholars have placed much emphasis on the emerging theory of transformational leadership as an appropriate model for school leaders. The roots of this theory are examined in this folio as well as modifications that have been proposed by scholars in the leadership field. The principles and practices inherent in the concept of transformational leadership are described and the implications for school leaders are synthesized.

Another issue at the center of debate in education is the emerging role of information technology in schools today. Some of the current realities of integration efforts are described in this folio. Incidents of use, misuse and non-use have been documented and are summarized. Then the potential for these new technologies to impact upon education is explored. The aim is to demonstrate the importance of continuing with integration efforts because of the potential positive impact it can have upon teaching, learning and reforming in education today.

Finally, the factors that impact upon the integration of information technology in schools are explored. Among these factors, the role of leadership has emerged as one that has a large impact upon the success of integration efforts. Thus the role of leadership in integrating information technology to create information age schools is the focus of the last paper in this folio.

ACKNOWLEDGEMENTS

The writer gratefully acknowledges the contributions made by the following

people throughout the writing of this Folio.

To my family, Lorraine, Vicki, Gail, and Neil, for your patience,

understanding and moral support.

To my hosts, Norm and Helen, for providing much appreciated comfort and

support.

To my advisor, Dr. Jean Brown, for your guidance and words of

encouragement along the way.

Table of Contents

CHAPTER ONE: INTRODUCTION

Overview

When I entered this master's program in educational leadership at Memorial University of Newfoundland, I had one year experience as a school principal and fourteen years teaching experience in rural schools on the Great Northern Peninsula and Southern Labrador. Having almost no theoretical basis and little knowledge of leadership principles and practices, I obviously had much to learn. Early into the program I became interested in the evolution of management theories, especially the emerging field of transformational leadership.

I wondered about the roots of transformational leadership and who pioneered this theory in the field of Education. I also wanted to know more about the actual principles and practices inherent in the concept of transformational leadership. My aim was to explore and summarize the components that demonstrate transformational leadership and determine if there was support for this kind of leadership in rural Newfoundland schools. If such support existed, what would transformational leadership look like in the school setting?

In addition to leadership, I was also interested in technology. As I completed more courses in the program, I became especially interested in the new information technology that was becoming available to schools. I soon realized that the information technology being used in the business world and the work world was not being integrated into schools in my district. As I began my research, I learned that there was a multitude of information technologies already available to schools and reasonably accessible to schools in this province. I also learned that these new technologies had enormous potential to have positive impacts upon teaching and learning. I decided to investigate this finding further. My aim in paper two was to explore the support for integrating information technology that could be found in the literature. I attempted to show the diverse functions that these new technologies could serve in the school setting.

Throughout the process I became increasingly aware that, although information technology could potentially be a very positive force in education, such was not the case in the

real world of schooling in many areas. My research then led me to investigate further why integration was not becoming a reality. A number of factors emerged from the literature that determined the success of integration. Upon further study I realized that a key factor that determined the degree of integration was leadership. I realized then, that there must be some connection between transformational leadership and information technology integration in schools.

Recognizing that transformational leadership involved building a learning organization (Senge 1990), and viewing the school as a community of learners, I decided to investigate how information technology integration was related to this kind of leadership. From my work as a school administrator, I knew that school improvement efforts revolved around achieving reform by attending to a number of paradigm shifts required for developing modern schools. Hence in folio three I decided to investigate the role of leadership in creating a community of learners in an information age school by initiating and facilitating a process for integrating information technology.

Rationale

What Do I Bring to This Work?

First of all, I bring my experience as a parent and teacher in rural Newfoundland communities. I have now completed the course requirements for the Master's program in educational leadership at Memorial University. I also have five years of administrative experience in rural schools to draw upon. Finally, I bring with me an interest and desire to know more about transformational leadership, the integration of information technology in schools and the relationship between the two.

As an administrator, a former fisherman, and the son of an outport fisherman, I have developed some understanding of the traditions, beliefs and values of the students, teachers, and parents in the communities where I have lived and worked. My teaching experience provides me with an understanding of school culture and the importance of relationships among all

stakeholders in the education enterprise. This understanding has partly emerged from my experiences working with parents who have a renewed interest in a modern education for their children as a result of the collapse of the inshore cod fishery and the ensuing out-migration from rural Newfoundland. Further understanding has developed as I have learned more about school reform efforts and the potential for information technologies to dramatically improve education in rural schools.

What Did I Hope To Learn?

Upon completion of this research, I hoped to internalize the concept of transformational leadership. I wanted to know where it came from, how it got started and how it was related to leadership in schools today. I wanted to know the principles and practices suggested by different components of the concept as well as the shortcomings described by critics in the field. I hoped to find out if I could apply this kind of leadership to my work and, if so, what would it look like in a rural school.

Throughout the work I discovered repeated connections between school reform, information technology and leadership in schools. Hence I hoped I could learn more about the interactions between these concepts. My overall aim was to search for ways to enhance the development of the best school possible for rural Newfoundland students. Therefore, I needed to find out what information technology was all about, what factors enhanced integration success and how leadership was connected to a process that might lead to the development of an effective information age school.

Purpose
How Will the Paper Folio Contribute to the Field of Leadership in Education?

The first paper in the folio traces the development of the theory of transformational leadership. It also demonstrates its support in the literature and examines its application to educational settings. By synthesizing the principles and practices of transformational leaders, it

hopes to provide some linkage between the theory and the practice for leaders in rural schools. Leaders in these schools could use this as a reference in a way that enables them to reflect upon current practice and explore ways to incorporate some of the ideas in school improvement and school reform efforts.

In the second paper, a rationale for the integration of information technology into the curriculum is developed. An exploration of the use, misuse, and non-use of this new technology should be helpful for school leaders attempting to assess integration efforts in their schools. The potential of these technologies supported by research and critical examination in the literature enables leaders to realize the importance of getting on with the task of integration.

Finally, the last paper explores the role for leadership in a school attempting to integrate these new technologies into its curriculum. The examination of different factors that impact upon integration efforts is an attempt to demonstrate the complex issues involved in the process. The need for leaders to view school reform and integration of information technology as interrelated topics is directly addressed. Finally, it demonstrates a need for leaders to develop systemic thinking and a large view -- a transformational view -- of leadership, if integration efforts are going to lead to the kind of education that students, and the whole community, need to be successful in the information age.

Scope

The examination of transformational leadership in this folio begins with the work of James McGregor Burns. In 1978 he espoused a kind of leadership that he called "transforming leadership" that could improve performance of leaders in organizations. Throughout the past two decades, several writers (Bass & Avolio, 1990; Tichy & Devanna, 1988; Yukl, 1994) have expanded and modified the ideas in Burns' theory and it has become known as transformational leadership because it purports to transform organizations. Leaders in the field of education (Brown, 1993; Hallenger, 1992; Leithwood, 1994; Sergiovanni, 1990) began to explore the implications of these works for schooling. Thus this folio traces the development of the theory in

1978 to the application of its ideas to leadership in schools today.

The folio then examines information technology and its potential to impact upon schooling. It also explores the role of leadership in schools that are attempting to integrate these new technologies into its curriculum. The research for these last two topics involved library searches and a synthesis of ideas to provide illumination and understanding of the questions raised in this study.

Organization of the Folio

The overall intent of this folio is to explore transformational leadership, the role of information technology in schools and the relationship that is evolving between the two. The folio aims to provide a practitioner's perspective on the way that the issues and concepts of school reform, transformational leadership, and information technology are inextricably intertwined. Chapter One, the introduction, introduces the purpose of the study and provides a brief overview of the rationale, focus and scope of the folio.

Chapter Two is Paper One. It traces the development of the concept of transformational leadership from its roots through a number of modifications and adaptations to the field of education. Chapter Three, Paper Two, examines how information technology is being used in schools today. It goes on to explore the potential of these new technologies to have an enormous positive impact upon education in our society. In Chapter Four, Paper Three, the factors that impact upon the integration of information technology in schools are examined. The specific role of leadership in developing a successful process of integration is then discussed in light of reform efforts and characteristics of information age schools. Because the topics are related and the literature for the whole folio is somewhat overlapping, only one reference list is supplied.

CHAPTER TWO: TRANSFORMATIONAL LEADERSHIP: ITS ROOTS, PRINCIPLES AND PRACTICES

Introduction

The impact of leadership upon the success of organizations has come under increasing scrutiny in the late decades of this century. At one end of a wide range of views is a belief that "once other factors influencing effectiveness are accounted for, it is likely that leadership will have little bearing on organizational performance" (Brown, 1982 p. 1). A less extreme position holds that leadership is important primarily for its symbolic role in organizations and can only have a limited impact upon the outcomes of the organization. A significant amount of research in the past two decades, however, would indicate that leadership is a key ingredient and vitally important to the success of organizations (Brown, 1993; Leithwood 1994: Senge, 1990; Sergiovanni, 1990).

In education, a great deal of attention and research effort has focused on the role of leadership, especially in schools. The "Effective Schools" literature of the 1980's emphasized the role of the principal as a significant factor in the development of effective schools. In recent years there has been even more support for strong leadership. Reform efforts always emphasize the role of leaders in institutionalizing change in schools. The kind of leader and leadership required to bring about change is called transformational leadership. In fact, some researchers feel that transformational leadership is the only style that is supported by empirical research (Fisher, 1994).

Like organizations in all sectors of our society, schools and school systems have been called upon to undergo restructuring. Scholars, researchers, and practitioners have struggled to define the role and function of leadership in paving the way to these more effective, more accountable, transformed schools for the twenty-first century. The concepts used to describe the role of leaders have moved from manager, to transactional leader, to instructional leader. In the

emerging theory of school leadership, these roles have been proposed, explored, modified and surpassed in the true sense of the modern adage that says "been there, done that, and moved on." Hallinger (1992) described the advances in leadership theory as being from manager, to instructional leader, to transformational leader. It is this latter role -- that of transformational leadership -- that is the substance of this paper.

Transformational leadership has been undergoing development, refinement and modifications for the past two decades. Its origins are usually traced to the work of George McGregor Burns (1978). In this work, entitled *Leadership,* Burns refers to a "transforming" leadership and compares it to "transactional" and "charismatic" leadership roles. His theory centered around the kind of leadership required to transform organizations into more productive, accountable and streamlined operations required in the post-modern era.

The concepts and constructs that make up the theory of transformational leadership have been extensively studied and developed in non-educational settings. Bass (1985) and Bass and Avolio (1993) have done extensive research into leadership theory. They have combined, expanded, and modified the theories of transactional leadership and transforming leadership to propose a theory that incorporates many of the views of Burns and others who have worked in the field. Much of these efforts have been directed towards the construction and refinement of a multi-factor leadership questionnaire (MLQ). This, in turn, has been used to further study the impact of leaders on life in organizations. Other authors have also studied and written about the impact of leaders on organizational performance (Bennis & Nanus, 1985; Depree, 1989; Senge, 1990; Tichy & Devanna, 1986).

Perhaps the greatest impact that this research has had upon education is the way the ideas have influenced writers in the educational leadership field (e.g., Brown, Leithwood, Sergiovanni). These writers have explored, adapted and related the principles and practices of transformational leadership to the field of education. The work of these writers will be explored and discussed later in this paper.

Schools in Newfoundland have been undergoing tremendous structural changes in the

past year, and it appears that the confusion and chaos of this will continue for some time. In addition to this, many school administrators in the province received their formal training at a time when theories of leadership centered around effective "manager" techniques or the very beginning of transactional leadership theory. Many have had little opportunity to internalize the theory of transformational leadership. This paper therefore, hopes to summarize and synthesize the practices and principles inherent in this theory of leadership.

First, a summary of the salient points made by Burns (1978) will be offered. It will go on to explore how a decade of work by various writers and researchers have modified and extended the theory into a body of literature that is now known as transformational leadership theory. This will be followed by an analysis of the impact of this theory in the field of education. The final part of this paper will attempt to synthesize the most current thinking in the field of transformational leadership. It will do so by suggesting guidelines for administrators who aspire to being transformational leaders in Newfoundland schools.

The Theory Developed

In the 1980's, management and leadership researchers were interested in the way leaders could revitalize and transform organizations. Many of them used the work of George McGregor Burns as a starting point in the exploration of this topic. Burns' conception of leadership, developed from descriptive research on political leaders, was called transforming leadership. For Burns, leadership should be conceptualized as a process in which "leaders and followers raise one another to higher levels of morality and motivation" (Burns, 1978, p. 20).

Burns opens his book entitled *Leadership* with "One of the most universal cravings of our time is a hunger for compelling and creative leadership" (p. 1). What concerned him most was that this "craving" was not being satisfied in the realm of contemporary leadership study. He felt there was something missing from the theories of management and leadership of the time and his aim was to develop a theory that would be more useful in defining the role of leadership needed in a changing world. To do so, he would delve into social and psychology writings of previous

decades to explicate needs, motivation, and morality in humans. He also contrasted his ideas with that of transactional leadership and argued that this theory did not accurately portray the true role of leadership needed for transforming organizations.

For Burns, leadership is " the tapping of existing and potential motive and power bases of followers by leaders for the purposes of achieving intended change" (Burns 1978, p. 448). In this conception, leaders would seek to raise the consciousness of followers by appealing to higher ideals and moral values such as liberty, justice, equality, peace and humanitarianism; and not to baser emotions of fear, greed, jealousy, and hatred. Leaders would also attempt to activate the higher needs of followers in terms of Maslow's (1954) need hierarchy. That is, followers would be motivated to satisfy their needs of recognition and self-actualization in their work lives.

Furthermore, "leaders could shape, alter, and elevate the motives, values, and goals of followers" (Burns, 1978, p. 425). The focus would be on the leader's role in helping people throughout the organization to move up through the levels of need and the stages of moral development. This, in fact, is the essence of transforming leadership. The true test of this leadership function would be its "... "contribution to change, measured by purpose drawn from collective motives and values" (Burns, 1978, p. 427).

In contrasting transactional leadership with his view of transforming leadership, Burns stressed the differences in motivation. In organizations governed by transactional leaders, followers would be motivated based on their own self-interests. Performance by a follower would be linked to higher pay, more prestigious positions, votes, and so on. The values of honesty, fairness and responsibility were admired and required; but only as they related to the exchange process and affected some end to be bestowed upon the follower. Burns also noted that transactional leadership concentrated on powers based on bureaucratic authority which emphasized legitimate power and respect for rules and traditions. Transforming leadership, on the other hand, emphasized influence based on exchange, inspiration, and the achievement of shared goals.

Burns argued that it was important to view leadership as a process. He emphasized the

fact that acts of leadership occur throughout organizations by members at all levels and in all departments. Leadership, he says "begins earlier, operates more widely, takes more forms, pervades more sectors of society, and lasts longer in the lives of most persons than has generally been recognized" (Burns, 1978, p. 427). It also entails a continuous evolution of interrelationships among members in an organization in a " ceaseless process of flow and counterflow" (Burns, 1978, p. 440). Burns saw political leadership as a means of elevating followership, just as the followers would continue to sustain their political leaders.

Transforming leadership is all about the realization of real, intended, purposeful change that is able to meet people's needs. It is a process where followers are 'engaged' and the final enterprise is able to make better citizens of both leaders and followers. It contributes to the long term benefits of all concerned. Though the ideas are abstract and complex, this pioneering work was to have a tremendous impact upon future scholars in the field. Burns felt that only by viewing leadership as a " function of complex biological, social, cognitive and affective processes" (Burns, 1978, p. 427), can we begin to generalize, formulate, and explicate a useful and universal theory of leadership for this post modern era.

The Theory Expanded and Modified

In the decade following the work of Burns, researchers and theorists expanded and modified the ideas of transforming leadership. This work has evolved into a body of literature that is generally known as Transformation Leadership and is still being refined by writers in the field today. Bernard M. Bass (1985) proposed a theory of leadership that examined and extended the ideas presented by Burns. Bass felt that the degree to which a leader is transformational is measured primarily in terms of the leader's effect upon followers.

In his work (Bass, 1985), he developed three components of transformational leadership: charisma, intellectual stimulation, and individual consideration. Later he would add a fourth called "inspirational motivation" (Bass & Avolio, 1990). Then again Bass and Avolio (1993)

proposed a model of leadership that included transformational, transactional, and non-leadership factors. In this model, based on extensive research and empirical data, the writers propose seven factors of leadership under three headings. They are briefly summarized below.

Factors of Leadership (Bass & Avolio)A.   Transformational Factors

Factor 1.   Charisma (Idealized Influence): leaders are respected and trusted by followers. They have high standards and are viewed as having an attainable mission and vision.

Factor 2.   Inspirational Motivation: Leaders provide symbols and simplified emotional appeals to increase awareness and understanding of mutually desired goals.

Factor 3.   Intellectual Stimulation: leaders encourage followers to question their own ways of doing things, to break with the past, and to clearly define their own realities.

Factor 4.   Individualized Consideration: In a learning and developmental context, followers are treated differently but equitably on an individual basis.

Transactional Factors

Factor 5.   Contingent Reward: Leaders ensure a positively reinforcing interaction or exchange with followers that facilitate the attainment of mutually agreed upon objectives.

Factor 6.   Management by Exception: Leaders interfere when things go wrong through the use of negative reinforcement and punishment.

Non-Leadership Factor

Factor 7.   Laissez-Faire: this describes an absence of leadership or avoidance leadership. It refers to a situation when there are neither transactions nor agreements with followers.

This theory differed from transforming leadership in several areas. First, a leader was transformational if he was able to transform and motivate followers to do more than they originally expected to do. Bass did not confine consequences to something that was ultimately good or bad. Burns felt that transforming leadership occurred only when a group was able to

progress towards desirable and high moral achievements. Bass would see Hitler as a transforming leader, Burns would not.

Whereas Burns felt that transactional leadership theories needed to be surpassed in the study of leadership, Bass and Avolio felt that parts of the theory were still useful. They emphasized the use of contingent rewards as a means to influence motivation, monitoring and corrective action. This was an addition to the idea of transforming leadership proposed by Burns.

Finally, the value of charisma as a leadership trait is viewed differently in the theories. Burns saw charismatic leadership as "unsubstantiated", and was not all that useful for a general theory of leadership behaviour. Bass and his associates, however, viewed charisma as an essential ingredient for potential leaders. The central issue in this disagreement may lie in the different views of what constitutes charismatic leadership. Burns felt that charisma was something that happened, and though valuable in some situations, it was not a leadership trait that could or should be developed. Burns felt that the greatest weakness of charismatic leadership is that any success in an organization depends upon the rise and fall of the leader and "hence it is no substitute for transforming leadership" (Burns, 1978. p. 267). Bass and his associates viewed charisma as the leadership quality that attracted followers. Charisma was what gave leaders so much of their influence upon followers, and the fact that it was rare, or difficult to develop, did not detract from its value to leaders of organizations.

The Work of Bennis & Nanus

In another major work focusing on transformational leadership, Bennis and Nanus (1985) concluded that charisma was not a prominent factor in leadership. In this five-year study of dynamic, innovative leaders, the researchers found that most leaders were very ordinary in appearance, personality and general behaviour. They found a great diversity among the leaders, but were able to identify some common themes that provided insights about the nature of effective transformational leadership.

Transformational leaders, first of all, lead the way in "developing a vision". They

channel the collective energies of members in their organization in pursuit of a common vision. They "move followers to higher degrees of consciousness, such as liberty, freedom, justice and self-actualization" (Bennis & Nanus, 1985, p. 218). More than this, the vision that is developed and pursued is " right for the times, right for the organization, and right for the people in it." (Bennis & Nanus, 1985, p. 107).

For Bennis and Nanus, the development of commitment and trust is a key part of transformational leadership. Persuasion and inspiration are important, not coercion. A wide use of metaphors, slogans, symbols and rituals are needed to develop and reinforce the vision. Leaders must 'live' the vision they are trying to promote. Actions, plans, and mission statements must be derived in the true spirit of collaboration with all members in the organization.

Bennis and Nanus also describe "facilitating organizational learning" as a key role in the leadership process. Leaders and followers engage themselves into activities that force them to consider their own assumptions. They develop skills in long term planning and methods for analyzing environmental changes and trends. This commitment to life-long learning with a view to the future ensures the longevity of transformational leaders.

Other Theorists

Tichy & Devanna (1986)

Tichy and Deanna (1986) identified very similar attributes of effective leaders. In their view, the process of transformational leadership is a sequence of phases involving: recognition of a need for change, managing the transition, creating a new vision, and institutionalizing the changes. Throughout this process, leaders would need to exhibit seven attributes. These leaders would have to be change agents, prudent risk-takers, sensitive to people's needs, articulators of core values, flexible, cognitively elite, and visionary, with trust in their intuition.

Senge (1990)

Senge (1990) identifies five disciplines needed to develop learning organizations. In *The Fifth Discipline*, Senge advocates the use of systems thinking, personal mastery, shared visions,

mental models, and team learning as a model for leadership. These disciplines he claims is able to "provide a framework for focusing the effort to develop the capacity to lead" (Senge, 1990, p. 359). The emphasis of this work is upon the leader's ability to develop a "learning organization" by focusing on the satisfaction of higher needs of individuals within the organization.

Senge asserts that systems thinking is a discipline for seeing wholes. It provides a frame work for seeing patterns and relationships. It allows leaders in organizations to see structures and patterns that underlie complex situations in a way that enables them to develop appropriate change processes for improvement. In order to be successful though, systems thinking needs the other disciplines that Senge (1990) describes. Building shared visions, mental models, team learning and personal mastery, within the context of systems thinking, allows people to build learning organizations. In these organizations, people are continually discovering how they create their reality and how they can change it.

DePree (1989)

In a much different way, Max DePree (1989) in *Leadership is an Art*, reiterates many of the same points made by Senge. In a series of short chapters, many of them with personal reflections, DePree writes a compelling account of leadership in organizations. The primary role of leaders he says is to help members of the organization define reality. A great deal of emphasis must be placed on relationships, rituals, morals, and responsibility throughout the organization. Leadership he claims is an art, "something to be learned over time ... (It) is more tribal than scientific, more weaving relationships than an amassing of knowledge"(DePree, 1989, p. 3).

Leadership is an Art is a collection of stories about rituals and relationships in a large organization. These stories demonstrate the organizations concern for the individuals well-being. They also illustrate how an organization becomes successful by attending to the needs of people who work in all departments. Autonomy and responsibility throughout this organization shows that leaders and acts of leadership exist in more places than the boardrooms or the plant manager's office, they occur anywhere throughout this organization.

The Theory Related to Education

Transformational leadership is particularly relevant to the current climate of change in schools (Leithwood, 1994). Leithwood (1994) demonstrates four premises that support the usefulness and applicability of transformational leadership in today's schools. First of all, the fostering of motivation and commitment among all stakeholders, inherent in the theory of transformational leadership, is the kind of extra effort needed for significant change. Second, the current focus on excellence in schools requires first and second order changes. First order changes allow schools to do things they already do more efficiently or more effectively without changing what they do. Second order changes that involve the development and sustenance of values and a strong school culture are best achieved in the realm of transformational leadership. Also, the complexity of the work involved requires empowerment of staff, dispersed influence, and leadership acts at all levels of the school. Finally, Leithwood contends a true professionalization of teachers is required in schools today. Emphasis must be placed on inspiration, staff development, and life-long learning. All of these processes require the skillful implementation of transformational leadership processes.

Consistent with Leithwood's findings regarding the potential of transformational leadership are the ideas of Thomas Sergiovanni. Sergiovanni (1990) proposed five dimensions of transformational leadership for schools. He advocates technical leadership which involves sound "management" techniques. The harnessing of social and interpersonal potential is required in addition to demonstrations of expert knowledge about education and schooling. Symbolic leadership with emphasis on modeling important goals and behaviors is also a key dimension. Finally, Sergiovanni describes the cultural leadership dimension. In this dimension, leaders articulate and strengthen enduring values, beliefs and cultural strands that will allow the school to develop a unique identity over time.

For Sergovanni, the technical, educational and human dimensions can enable a school to

become effective. However, it is the symbolic and cultural dimensions that will allow it to achieve excellence. It is in these dimensions that the hand, the head, and the heart of leadership become intertwined in continuous efforts to build excellent schools that society demands today (Sergiovanni, 1990).

Leithwood (1994) summarized much of his, and his colleagues research on the transformational leadership process through the articulation of four dimensions of the process. The first dimension is concerned with the development of a widely shared vision for the school. This involves building consensus among all stakeholders about school goals and priorities, and holding high performance expectations for improved results. The second dimension centers around concern for individuals. It involves providing individualized supports, intellectual stimulation and modeling professional practice throughout the organization.

Encouraging dispersed leadership is the third dimension articulated by Leithwood. In this dimension democratic-decision making and team responsibility comprise leadership activities designed to encourage ownership for achieving goals. In the fourth dimension, leadership is concerned with strengthening the school's culture. It must use a variety of mechanisms to stimulate and reinforce cultural change using symbols and rituals to express cultural values. Hence leadership must engage in direct and frequent communication about cultural norms, values and beliefs in addition to sharing power and responsibility with others.

For Leithwood, the transformational leadership process is all about helping to define a cultural identity, using symbolic language and rituals to reinforce that cultural identity, and ensuring that a school is responsive to changing circumstances in its environment. It also requires a capacity to engage others in a commitment to change.

In relating the theory of transformational leadership to the field of education, it is noteworthy that many of the writers place significant emphasis on the symbolic and cultural dimensions of school leadership. Management, accountability, and knowledge dimensions are important, but they are not enough by themselves to ensure the development of excellent schools. Although writers and researchers in the field have focused on various ways to develop and

enhance the symbolic and cultural dimensions of schooling, they generally rely upon the principle concepts of transformational leadership as the process required to achieve success.

Implications for Leaders in Education

Transformational leadership then is a process with a variety of interwoven variables operating at any given time. Therefore it is difficult to write a linear description of the process in a step-by-step form. In an attempt to bring all of the above research together so that it has some value for practicing or aspiring leaders in schools today, a list of practices exhibited by transformational leaders will be offered. This will be followed by a 'toolbox' of concepts needed by a transformational leader. Then there will be some discussion on the implications that all of these things have for leadership in schools today.

From a wide range of writers in the field of educational leadership (e.g., Brown, Leithwood & Sergiovanni), and from numerous research efforts over the past two decades, the following summary of practices of transformational leaders can be compiled.

Practices of Transformational Leaders:

* sharing a vision

* building a learning environment

* being a positive role model

* recognizing individual abilities and values

* reinforcing self confidence and independence

* supporting followers

* driving out 'fear' from the organization

* encouraging participation and self-expression

* fostering continuous improvement

* encouraging persistence

* emphasizing intrinsic outcomes

* advocating shared leadership

In order for leaders to engage in such practices in school settings, there are many "tools of the trade" that will prove helpful (Hargrove, 1995). Based on the research in this review and drawing on a number of sources (e.g., Sergiovanni, 1996) the following is a collection of various concepts inherent in transformational leadership.

The first set of tools are concerned with the development of higher-order thinking skills in individuals. They include starting with a beginners mind, setting personal stretch goals, and encouraging individuals to see things in different ways. When individuals observe situations from the premise that they can learn something if they view it from a different perspective, they often reflect upon basic assumptions and opinions that impact upon their perception of reality. Setting personal stretch goals in this context, enables people to think outside the box and to bring out the best in themselves and those around them. Another set of tools are concerned with communication among members in a group. They involve effective listening and speaking, collaborative conversation ground rules, the development of common perspectives and constructive feedback. Leaders who develop skill in communication, speak with honesty and integrity, and listen with empathy so as to step into the other person's frame of reference. Encouraging collaborative conversation ground rules allows people to discuss difficult situations in a non-threatening environment. In such an environment, people with different views and perspectives build a common understanding of the realities they hope to create. Conversations and communication are encouraged and supported by leaders who continuously provide positive and constructive feedback to those involved.

Leadership in schools must always be concerned with resistance to change (Fullan,1990). A third set of tools for transformational leaders involves identifying resistance, and distinguishing between observations and assessments. Resistance to change is caused by people's disagreement with formal policy or by blocked mental models (Hargrove, 1995). Leadership initiatives that open lines of communication with change resistors are invaluable. They help people distinguish between observations and subjective opinions or judgments so that they can see where they have jumped to conclusions or made negative assessments based on biased assumptions.

A final set of tools involves the development of a "can do" attitude throughout the school community. This can be accomplished by planning breakthrough projects that involve a group setting a short-term, measurable goal that can be achieved with existing resources, authority and change readiness. Leaders can follow up these projects by holding people accountable for sincere commitments. Having explicit conditions for satisfactory results can eliminate breakdowns and forward actions by different groups in the school as well as encouraging leadership activities from different stakeholder groups.

Yukl (1994) in his work on public administration, identified several implications of the theory of transformational leadership for organizations. Synthesizing the research reviewed so far, and using the headings suggested by Yukl, the following guidelines for school leaders who hope to become transformational leaders are suggested. These guidelines are discussed in terms of activities and processes that leaders must initiate, facilitate and foster among the different stakeholder groups that make up the school community.

Leaders in schools must first of all be concerned with the development of a clear and appealing vision. Appealing to a universal need in humans to feel good about themselves, the vision for a school should empower individuals and serve as a source of self-esteem and common purpose (Sergiovanni, 1990). It should contain an idealistic picture of where the school is headed. Also, the vision must be crafted and explicated by and for all stakeholders and must emerge from a common understanding of current reality. Yukl (1994) asserts that the vision must be a "joint product of experience, personal interests, intuition and circumstances" (p.369).

This vision will not be enough on its own. Leaders must initiate and facilitate a strategy for attaining the vision. A well written plan by a number of leaders will not accomplish this vision (Fullan, 1993). The strategy must emerge from the realities of the people involved. Developing and supporting themes that support the vision will be important. Emphasis must be placed on communications and student achievement in the strategic planning process. Finally, strategy must focus on improving the quality of life in the school for individuals and groups.

Part of the leader's role throughout this process will be to articulate and promote the vision.

The degree to which the vision is promoted will have a large impact upon its success (Manges & Wilcox, 1997). Leaders can use symbols, metaphors, stories and slogans to promote the vision. Repetition of key concepts in the vision at staff meetings, student assemblies, parent gatherings as well as in informal settings contribute to the promotion of the vision crafted by the school.

Leadership in schools can enhance transformational qualities by expressing an air of confidence and optimism. Leaders can create these attitudes by reminding people how they overcame previous obstacles. They can also review and remind people about strengths and assets that are present in individuals and groups to foster confidence in themselves and in others. Short "can-do" projects with clear goals and performance expectations help build confidence which is highly contagious in school settings. Leaders can also increase confidence levels by finding ways to celebrate successes in the school. This can be accomplished by creating ceremonies and rituals that enable people to recognize contributions of individuals and groups. Participants need to feel they are contributing, and finding ways to recognize contributions will reinforce participation and commitment.

Leaders can also exhibit transformational qualities by using dramatic, symbolic actions to emphasize key values. These actions help build commitment among all constituencies with the school community. Highly visible actions that show concern for student welfare or compassion for teachers on difficult days, have much more value than talking about these concerns. These symbolic actions are especially effective if they are unconventional, and demonstrate self-sacrifice by the leader (Sergiovanni, 1990). Furthermore, leaders must model actions that demonstrate key values such as honesty, integrity, emotional stability, and commitment. Effective communication skills will be essential in this modeling role so that individuals do not misinterpret actions of leaders as criticisms of their behaviour (Schofield, 1995).

An essential role for school administrators who aspire to being transformational leaders involves creating, modifying or eliminating cultural forms. School mottos, sports groups, after school clubs, student councils and student support activities are all part of a school's culture. Leaders should create, modify and promote the concepts that symbolize the emerging values in

the school's vision. They should also eliminate ideas and efforts that no longer contribute to attaining the vision being crafted by and for the school.

Above all else, transformational leaders need to be catalysts and agents for change. Fullan (1993) asserts that "educational leaders must learn to influence and coordinate non-linear, dynamically complex, change processes" (p.74). Leaders must seek to initiate and institutionalize change, but must not attempt to control it (Leithwood, 1994). Having a firm grasp of change concepts and processes and combining these with the right amounts of pressure and support for change can greatly enhance the development of transformational leadership characteristics.

Conclusion

Restructuring, renewal, and the pursuit of excellence are at the very core of efforts in education today. The need for schools to embark on a journey of renewal and transformation is well documented. The details of how to get there and what the schools will look like upon arrival are very much unknown. Even though there have been extensive preparations made, unscheduled interruptions along the way have slowed progress. Many ambiguities and obstacles still must be overcome before the destination becomes clear. Strong leadership will be an essential part of the journey ahead. Leadership that incorporates the practices and principles presented here as transformational leadership can truly contribute to the cause.

Some critics may say that transformational leadership is too "wishy-washy", soft, sentimental, and the stuff of dreamers who are out of touch with the realities of the current agenda in education. The evidence suggests that this is not the case. This kind of leadership requires rigor, strength, and passion that is unsurpassed in leadership styles. It requires a passionate commitment to a dream, the courage to face opposition and nastiness, a sense of humor to deal with disappointment and betrayal, and a sense of perspective to look towards the long haul. This in turn requires leaders who are strong, with a deep rooted sense of morality, and who possess effective means of revitalizing themselves and those around them. These are the leaders who will keep up the continuous struggle to change, to reform and to improve schools in

pursuit of excellence. These are the leaders who develop and utilize transformational leadership processes in their schools.

CHAPTER 3: INFORMATION TECHNOLOGY: CURRENT REALITIES AND POTENTIAL TO IMPACT UPON EDUCATION

Introduction

Among the many items competing for the attention of leaders in schools today, the integration of technology into the curriculum ranks near the top. With tremendous advances in the volume of software, diversity of applications, deployment in the modem workplace, and availability to students, technology continues to force itself upon the education system. The potential impact of this technology upon teaching and learning, its potential to perform many of the menial tasks in administrivia and its potential to act as a catalyst for reform, make it increasingly more difficult for schools to ignore this intrusion.

This pervasive nature of technology (Johnson, 1997) has elicited a wide range of responses; both from critics and scholars who have examined its impact upon schooling, and from schools and school systems charged with the responsibility of preparing students to live in the information age. The degree of implementation of these new technologies has also experienced a wide range of success. The literature is replete with both success stories and with failure stories of technology integration. The potential for technology to impact upon schooling, and the role it should play in the latest calls for school reform continues to be debated as more and more research is compiled.

In this research, a variety of words and teams have been used to describe these new technologies. The practices and processes surrounding the integration of computer technologies has been referred to as: Computer Assisted Instruction (Steinberg, 1992), Instructional Technology (Means, Olson & Singh, 1995), Integrated Learning Systems (Van Dusen & Worthan, 1995), Electronic Learning (Tucker, 1995), and Educational Technology (Mergendoller, 1997). In the more recent literature, many writers have used the term Information Technology (eg. Loveless, 1997), as the concept to encompass these new technologies in the

school setting. According to Loveless (1997), information technology includes "the personal computer, its peripherals, and the displays they control" (p. 100). Throughout the remainder of this paper, information technology will be used to convey this same meaning. It will include computers, CD-roms, scanners, digital video displays, and all the devices used to access the Internet. In short, it refers to all the technology and tools surrounding the personal computer that is available for use in schools today.

Using this conceptualization of information technology, this paper will review some of the recent findings concerning the impact of these new technologies on education today. It will provide a brief summary of some of the cautions and criticisms surrounding the use of advancing technologies in the classroom. It will then describe some of the current practices that exist in schools regarding how information technology is being used in the classroom. These preliminary discussions will lead into the main part of the paper, which is to explore the role that information technology could potentially fulfill in schools today. To do so it will examine how information technology can have positive impacts upon teaching, learning, and reforming our education system. Here, reforming refers to the recent efforts to change, to restructure, to improve, and to transform schools into more relevant and more accountable institutions demanded by society today.

Impact on Education

There have been tremendous developments and advancements in the field of information technology in the past decade. This, combined with various degrees of integration into schools, and increasingly impatient calls for schools to restructure and reform, has led to a whole gamut of conclusions regarding the impact that information technology will have on our education system. Some critics caution that these new technologies may have a negative impact upon the education of students (e.g., Sardello, 1991), while others see it as a panacea for what is wrong

with education today (Pucel, 1995).

In between these two extreme positions, there are more moderate views. Cohen (1988) argues that new technologies seldom have any great impact upon daily classroom practices and information technology too is only a passing `fad' that will soon give way to the next bandwagon effort to come down the education restructuring pipeline. Other critics see potential for information technology to have positive impacts upon education but feel that scarce resources and the structure of the education system make it unlikely that most of the real benefits will become entrenched. Still others (e.g., Willis, 1993) argue that new developments in information technology make it more and more likely that education can and will be greatly improved. They advocate careful analysis of schools and the process of educational change to examine when, where and how information technology can best be employed to effect positive change in the education we provide to students. A more detailed analysis of these widely divergent views follows.

Negative Impact

The increasing presence and use of information technology in schools have not convinced everyone that this is a worthwhile endeavor. A number of critics, (Franklin, 1990; Kearsley, 1998; Sardello, 1991) still caution against the indiscriminate and ever increasing influx of these new technologies in today's classrooms. While the numbers of dissenting voices have declined somewhat in recent years, the fears they express must be considered in attempts to define the role of information.technology in schools.

The features that alarm critics and writers about mass infusion of technology in today's classrooms center around several key issues. One is the negative effects it has on the social development of students (Sardello, 1991). Another is the high cost of emerging technology that detracts from investment in more useful resources (Ely & Plump, 1988). Still another involves the likelihood that technology will lead to more inequality of opportunity in the field (DeVillar & Faltis, 1991), and finally critics caution that these new technologies have the potential to hinder

school reform because it tends to reinforce traditional hierarchical power structures in schools (Markus & Bjorn-Andersen, 1987).

There are those who caution that technology in the school curriculum creates robots-students who are individualistic with an inferior sense of values and morals (Sardello, 1991). Exposure to technology they say, leads to the development of "technophytes", it dehumanizes students and jeopardizes compassion and commitment to humanity (Fullano, 1991). It also decreases opportunity for cooperation and interaction among students and between students and teachers in the classroom (Gearhart, 1983). Thus students do not develop social skills for collaborative efforts that are so necessary in society today.

In many schools today, the struggle to pay photocopier and phone bills make the prospect of acquiring enough hardware and software to integrate informational technology into its curriculum all the more daunting. Critics claim that extra funding would be more wisely invested in things such as new reading programs or extra support staff. They also identify other expenditures in technology (e.g., VCR's and Commodore 64 computers) that have not been used and are now relegated to storage rooms and which have hardly ever seen the inside of a classroom. For many in education, spending money on these new technologies will have a negative impact because it means other more appropriate programs will receive less funding.

One of the greatest fears of those who are skeptical about the impact of information technology is that it will exacerbate existing problems in attempts to provide equality in the system. They claim that these technologies will benefit the rich, the more academically able and male students in schools. Information technology they claim will widen the gap between the haves and have-nots. DeVillar and Faltis (1991) claim that low income, minority, female students have less access and fewer quality learning experiences with information technology than do middle class, white males. Without equity they claim "the existing disparities in academic achievement between groups can and will only widen" (p.130).

There are some critics in the field (e.g., Gearhart, 1983) who argue that information technology is counterproductive to new efforts to restructure power relationships in education.

Whereas many reform efforts call for a flattening out of the power structure and more collaboration among stakeholders, information technology, they claim, tends to reinforce traditional forms of hierarchical power structures. It does this by placing the power of decision making into the hands of a few who have access to and/or learn to use these new technologies and thus create a reliance on them by those who do not. Thus, the chances of more collaborative efforts among parents, teachers, administrators and school district officials are less in schools where these technologies became entrenched.

These views serve as cautions that must be considered by those who would integrate technology throughout the curriculum in schools. While not all-inclusive, they represent the major fears and concerns by people who have a significant stake in the progress of education towards successful reform.

A Panacea

At the other end of the spectrum are people who claim that information technology will revolutionize education. There have been claims that computers can replace teachers, increase student motivation and guarantee equality for all students in the classroom (Schofield, 1995). Those who make these extravagant claims believe that information technology should be brought into educational settings simply because "it's there". People who adhere to this logic, known as the Everest Syndrome (Maddox, 1987), believe that the mere exposure to computers will be beneficial to students. They feel that information technologies should be used for any and all tasks and "if schools can only obtain a sufficient quantity of hardware and software, quality will take care of itself" (Maddox, 1988, p.5).

Those who advocate full scale infusion of information technology tools into classrooms often refer to values identified in the business world (Lockard et al., 1990). In general, these values include work speed, work efficiency, work power, and the removal of human error from work activities. Evidence of writers making extravagant claims for information technology in education settings is demonstrated by Worzel (1994):

The students are prospering because they are all working at their own speed. The more able students get enriched material to challenge them. The troubled students get additional material and explanations to support them, including explanations in their home language if English is their second language, plus their teacher's individual attention as needed. Nobody gets labeled as a "brown-nose" or "dummy", because nobody except Mrs. Brown and the principal know where anyone else is in the curriculum. (p.133)

Such extravagant claims for the potential of information technology to impact upon education occur all too frequently in the literature today (Maddux, 1987). Okolo et al. (1993) reiterates this view and also claim that unrealistic expectations is one of the major factors that have limited use and understanding of information technology in schools.

A Passing Fad?

Unfortunately, there are a number of people, some in fairly prominent positions, who feel that all the hype over computers and information technology in education is passé. "We've heard it all before", they say, "the same hype and hoopla was around when 16 mm films, VCRs, instructional television, and a host of other technological advancements were developed" (not a direct quote). Critics often cite this "pendulum syndrome" as a typical reaction of the education system to advancements in educational technology (e.g., O'Brien, 1994).

In this pendulum syndrome, first there are extravagant claims about the potential for some new technology to impact upon education. This is followed by a period of excitement and eager anticipation about the "new" education system that will evolve. Schools and school systems make all kinds of effort to acquire and integrate the new technology into its curriculum. Soon however, teachers see that the reality of the classroom has changed very little. The new technology does not live up to the grandiose claims made by its advocates. This often leads to a period of frustration, disenfranchisement, and eventual abandonment. Teachers revert to old ways of teaching and the new technology remains largely unused.

While this view may be somewhat harsh and over simplistic, there are many real fears that this is exactly what will happen to information technology in schools today. The failure of

current in-service methods, the present structures in education, and the systems' natural resistance to change are reasons enough to believe it could happen.

Positive Impact

Most of the recent writings in the field of information technology are much more positive. The impact of these new technologies on education is now largely seen as dependent upon the degree of integration and implementation. These in turn are dependent upon an understanding of a number of complex and intertwining variables. The focus now seems to be on when, where and how to integrate information technology into the curriculum rather than if it needs to become an integral part of schooling today.

It is generally felt that given proper consideration to how schools change, and with the proper supports in the right place at the right time, information technology can have a positive influence on efforts to provide a more relevant education in the information age. This impact is explored in more detail later, but first this paper will examine some of the ways that information technology is being used in schools today.

Current Realties

How is information technology being incorporated into schools today? Researchers and critics have analyzed this issue in two different ways. Some (e.g., Johnson, 1997) have described various phases or stages that schools go through in attempts to integrate technology into its program. Others (e.g., Cates, 1995) talk about the prevalence of use in the curriculum.

Many schools have tried to incorporate information technology in stages. Generally these include familiarization, acquisition and integration. In the first stage, individuals in a school attempt to make all stakeholders aware of the beneficial role that information technology could play in delivering the curriculum to students. School district personnel, administrators, teachers, parents and students are all involved in discussions about hardware, software, and how these will become part of classroom life in the school. This is followed by a stage of acquisition. Schools,

school councils and school districts attempt to acquire the resources that will allow for integration. This usually involves applying for grants, fundraising, and soliciting groups and organizations for funding. These two phases of the process, while not complete, have been ongoing in schools for some time. Many schools have acquired hardware, software and other peripherals, and are searching for the most appropriate uses for these new technologies in their programs.

The third stage of this process involves the actual integration of information technology into the curriculum. It includes learning about and learning with these new technologies. It also assumes widespread use of information technology by administrators, teachers, and students in the day to day business of learning. While visions of final integration vary from school to school, most critics believe it has not happened yet. The following is a description of where schools are in terms of moving through these stages of integration.

There are some schools today that have made minimal progress towards technology integration. Generally, they have encountered one of two insurmountable obstacles. The first is where a school has failed to acquire any significant amount of funding for these new technologies. Where school leaders, teachers, and parents have not attempted to become aware of the potential for information technology to impact upon schooling, and where little effort and interest has been demonstrated, school districts have been reluctant to invest in expensive resources. Thus, the school has not even started in Johnson's phase one, familiarization with its possibilities.

The other part of this scenario includes schools who have skipped phase one and have attempted to implement Johnson's phase two, acquisition, first. These schools have acquired a sufficient amount of equipment for information technology integration, but have made no progress in familiarization or the development of interest among staff members. Administrators or a technology teacher may have some ideas about the positive impact of information technology, but have not been able to communicate the importance of its integration to all staff. This occurs where teachers still suffer from "technophobia", or where a number of staff members

feel that it is too late in their career to adopt new strategies for teaching, new theories about learning, and new roles for teachers and students in the learning process. Therefore schools that have acquired technology equipment often have chaotic and unusual setups and designs, hence making it unlikely that these new technologies will become integrated anytime soon.

There are a number of schools however, that have moved through Johnson's stages one and two with a fair degree of integrity to the overall process. Having acquired the necessary equipment, these schools are still finding it extremely difficult to change. Because of a number of reasons, such as lack of clear vision, lack of attention to the change process, or some other cause, these schools are finding that little has changed in the way students are taught and evaluated. In other words, these schools have made no progress towards real reform in practice.

Fortunately, there are some "pockets of success": instances where schools and teachers are making much progress towards the integration of information technology into their daily curriculum. Students and teachers use the Internet for research and for communicating with others. Information technology is being used in physics labs, and for publishing school newspapers and other student documents. There are also attempts to have parents become more technology literate via e-mail and library tutorial sessions. While the process is still evolving, information technology is having a positive effect on teaching and learning in these schools.

Although data about the number of schools functioning within each of the scenarios described above is not available, such data would be interesting, but probably disappointing, for those who advocate the use of information technology in schools. Where schools go from here will largely be determined by how the issues and concerns involved in real integration of information technology are addressed throughout the education system.

Another way to get a picture of how information technology is impacting upon education is to examine its use in schools. *Use* here refers to how frequently and intensively the technology is employed for either administrative or instructional purposes. While this notion is similar in some respects to the Johnson's stages of incorporation described above, there are some characteristics of this view that can more clearly illuminate how the integration of information

technology is progressing in schools today.

In some schools, information technology has almost no bearing on the curriculum. This 'non use' of technology occurs where neither the administrators, the parents, nor school district personnel has had any impact upon encouraging further use by teachers (Lockard et al., 1990). The equipment is either not available, or is set up in a computer lab where most teachers "fear to tread." It is used only when the school offers preliminary courses in word processing or microcomputers. Most of the time the tools that could be used for integrating information technology are sitting idle.

In other schools, there is a misuse of these technologies. Students, and sometimes teachers, use them as toys to play Nintendo-like games. In such cases it is often thought of as a reward for finishing seat work early or for good behavior. Some administrators use these new technologies as trophies to show off to parents and the community (Collis & Anderson, 1994). They claim to be on the "cutting edge" and progressing into a new era of education. Another kind of inappropriate use occurs when teachers use information technology tools for drill and practice exercises only (Schofield, 1995). While this use is acceptable as part of the total process it is not a wise use of expensive resources if this is the only function they serve. In reality there are no positive impacts upon the education of students where these new technologies are misused.

As described above though, many schools are making appropriate use of information technology to deliver the curriculum to students (Collins, 1998; Hancock, 1997; Reiber & Welliver, 1989). They are introducing basic courses to younger students every year (Burke, 1995). They are involved in providing collaborative, interactive learning experiences via these new technologies (Hancock, 1997). They offer design technology and communications courses. They use the Internet for communicating with other schools around the province and around the world. These "exemplar" schools need to be applauded and cited as models for schools who are 'bogged down' in attempts to integrate information technology. It is also imperative that all stakeholders in education become aware of the potential for information technology to drastically

improve many facets of education. Some of the ways it can do so is the focus of the remainder of this paper.

Potential Role

It has become fashionable in academia to lament about the failure of information technology to impact upon education (Johnson, 1997). Information technology in itself does not improve achievement in schools, and in some cases it is simply a waste of time and effort (Van Dusen & Worthen, 1995). While research clearly shows that information technology has not lived up to its promise, there is still a measure of confusion about the most effective roles that these technologies can play in education (Willis, 1993). There are however, a number of valuable lessons that can be gleaned from the literature.

A beginning is to start with the premise that information technology alone cannot and will not bring education reform. It is not a cure for poor teaching, under-funded programs, poor community participation, lack of discipline, and all the other things that are wrong with education today (Goldberg & Richards, 1995). It must also be realized that for schools to evolve to a state where information technology is highly integrated throughout its curriculum "involves many complex, diverse, and uncertain organizational processes" (Riffel & Levin, 1997, p. 51). In this context, the following is offered as the potential positive impacts that information technology could have on schools with a vision for preparing students to live in the information age.

Impact Upon Teaching

In the school reform literature, there are several aspects of teaching that must change if real reform is to be achieved. Perhaps the most important is the realization that "teachers are critical participants in educational change, particularly one involving dramatic changes in instructional practice" (Cates 1995, p. 66). Informational technology can have a significant role in providing both the impetus and the means for achieving changes in professional development, pedagogy, and for expanding and modifying the role of the teacher in the classroom.

For professional development, software communication tools and the Internet allow teachers to access all kinds of information about how information technology can be used in the classroom. It also allows communication with other teachers in his or her subject area. This consultation with others can alleviate some of the isolation that teachers feel about working in classrooms and not knowing how others approach the same problems they encounter every day (Willis, 1993). Some information technology tools, like software tutorials, enable teachers to practice the skills needed to use these new technologies in the classroom.

The need for different and more current teaching practices is often discussed in the reform literature. Using information technology in the curriculum can act as a catalyst by encouraging teachers to re-think learning theories and teaching methods. Teachers who integrate these new technologies often share insights, resources, and strategies with students and analyze student learning in light of theory and practice (Baron & Kallick, 1985). This re-thinking of learning theory is so vitally important for teachers who have been in the field for some time. Some fresh ideas about the relationship between the theory and practice of how learning takes place in the classroom is needed in many schools that seek to implement reforms.

It is in the area of redefining, reshaping and expanding the role of the teacher that information technology has the most potential to impact upon school reform. Greeno (1991) argued that information technology would allow teachers to move away from a didactic-structural approach to teaching, where the teacher is considered to be the expert and the provider of all information required in the classroom. Instead, he claimed, teachers would use a more exploratory-situated approach where students explore and investigate in an atmosphere of support from the teacher acting as a guide or a coach.

Another potential area where information technology could impact upon teaching is the way it allows teachers to model desired behaviors for learning. Jones (1992) contends that teachers should take the lead by modeling for students the way to select appropriate learning strategies, and by demonstrating how these strategies might best be employed. Costa (1985) supports this claim in his finding that students who acquire and exercise thinking skills have

teachers who model these behaviors in the classroom. So, in addition to being a guide, a coach and a facilitator, the teacher becomes a model for desirable behaviors which is another valuable teaching strategy.

Teachers who have integrated information technology into everyday practice, spend less time dispensing information (Wiburg, 1997). Hence they have more time to provide for individualized instruction. These teachers can spend more time with `slower learners' or with individual concerns that arise throughout the day. This can encourage the development of a master-apprentice relationship with students. Having the time and resources to address individual concerns is part of the changes required in the latest calls for reform (e.g., Cates, 1995).

In summary, information technology can play a key role in allowing a teacher to become literate in using the tools and to communicate and collaborate with others in the field. It also provides opportunity to access, examine, refine, and adapt features of the latest thinking in theories of learning and teaching. Furthermore, it encourages teachers to modify and expand the role they play in providing a quality education to students today.

Impact Upon Learning

Reforming education is concerned with changing views on how learning occurs. It involves knowledge construction as opposed to reproduction. It calls for learners to acquire high level cognitive skills and efficiency in problem solving. These in turn necessarily advocate changing the way we deliver programs to students in our schools (Cates, 1995). It implies collaboration more than competition and it involves reflection on concepts learned more than a prescription of skills needed. Information technology can positively impact upon all of these changes. It can also contribute to the notion of life-long learning and the development of an idea in all education circles that the most important skill to be learned is the skill of learning how to learn (Schofield, 1995).

In this context, the role of information technology is best demonstrated by thinking about

the various functions it can perform in efforts to initiate and internalize such changes among all stakeholders in the field. Information technology can be used as tools for accessing information, representing ideas, communicating with others, and for generating products. These tools (word processors, spread sheets, Internet access tools and others) enhance the productivity of students in the classroom. Use of these tools encourages students involvement in the learning process. Costa (1985) contends that only through serious involvement with content will students be challenged to construct knowledge as opposed to reproducing knowledge for tests and grades.

Using tools to communicate with others enables learners to benefit from the knowledge that others possess. It allows them to develop an appreciation for collaborative effort with classmates and indeed peers from afar via the Internet. Students who cooperate and collaborate on work projects observe, imitate and learn from each other. According to Collins (1991), they also use more collaborative approaches to learning and hence develop team skills so necessary for success today.

In addition to being thought of as tools, information technology can be seen as cognitive aides. The use of these technologies to articulate and represent knowledge can amplify learners' thinking. Data bases, multimedia, and hypermedia applied in a variety of subject matter domains are valuable resources for developing higher order thinking skills. Use of these cognitive aids will necessarily enhance critical thinking skills and problem solving ability in students (Hancock, 1997).

Finally, information technology can be thought of as a context provider (Mergendoller, 1997). In this way, it has great potential to make education more relevant to students. It provides real possibilities for representing real world problems and situations. Increasingly sophisticated software, situated learning environments and virtual reality technologies allow students to analyze real world problems. It allows them to immediately test hypotheses and evaluate outcomes of decisions they make. These benefits could in turn positively impact upon student interest and efforts which must also be an intended outcome for integrating information technology in schools today.

In the learning situations described above, the learner has more autonomy to choose material and topics for intense study. Working collaboratively with the teacher, learners can also negotiate goals and targets for a learning situation and then be expected to reflect and evaluate whether the required learnings were achieved. Jones (1992) noted that students involved in setting goals and monitoring how well they are meeting these goals will "naturally become more critical, divergent and creative thinkers" (p. 7).

In addition, information technology has great potential to provide a quality education to more heterogeneous groups. It is equally adaptable to rural situations as it is to urban sites (Stevens, 1994). It is advantageous to average learners, high and low academic achievers, as well as special needs students. The potential to impact learning for all students in all subject areas should make the integration of these new technologies a priority for all educators.

Impact Upon Reforming

Having examined the potential for information technology to be a catalyst and promoter of changes to teaching and learning, it is now appropriate to look at other aspects of reform in education that can be enhanced by these technologies. The literature reveals that the kinds of changes described above will not happen in a vacuum. They must be supported by changes in the culture and structures of schooling. How then, can information technology contribute to the kind of systemic change needed to sustain real change in the classroom?

First, leaders in schools can use these new technologies to assimilate information and communicate with all stakeholders in the school program. This can encourage more cooperative and collaborative efforts in developing and communicating a vision for the school. It will necessitate empowering teachers, students, and the community to perform tasks related to achieving a new vision of teaching and learning. Information technology can assist these collaborative efforts among diverse stakeholders groups by accessing information and providing opportunity for exploring and evaluating new ideas.

Furthermore, parents and teachers will be able to communicate about students work via

personal electronic mail boxes and email. Parents and other community members can have access to classes, libraries, homework hotlines, school bulletin boards, community channels, and other resources to assist them in helping their children succeed in school (Faison, 1996). In this way, information technology can truly help a school to become a community of learners (Senge, 1990)

School administrators can use information technology to explore alternate ways of scheduling in schools (Cohen, 1988; Schofield, 1995). More bloc-time periods for diverse groups could be used to enhance literacy throughout the curriculum. Also a new way of evaluating and reporting success for students and the school could be developed using information technology. These new technologies lend themselves well to the development of school portfolios and profiles. They also have a number of uses for teachers and administrators in tracking individual students and matching them to a variety of programs. These innovations encourage more individualized programs and more innovative paths to graduation from high school.

A key role for information technology in the whole process is the way it will allow school leaders to model uses for these new technologies in the school setting. If students, teachers, and parents are to adopt a vision for information technology rich environments, it is essential that they see people using and integrating these technologies in daily practice.

Conclusion

This paper began by illustrating some reactions to the pervasive nature of technology in society. It went on to review some of the literature concerning the impacts that information technology will have on the field of education. Then it described a number of scenarios about how information technology is actually being used in schools today.

Finally, the potential impact of information technology to enhance efforts in school reform were examined. It demonstrated various roles for information technology as a catalyst and promoter of change to teaching and learning as well as altering the structures that support

and maintain these positive changes. The focus throughout has been to demonstrate why schools need to work toward integrating information technology into its curriculum.

Information technology is here, and in many schools it is here to stay. Developing the vast potential of these technologies to have positive impacts upon the transformation of schools must be the underlying focus of all efforts to improve schools.

CHAPTER 4: INTEGRATING INFORMATION TECHNOLOGY: THE LEADERSHIP ROLE

Introduction

Information technology has now permeated nearly every facet of society. The business world, the workplace, and the home all make extensive use of these new technologies (Willis, 1993). There is a perception however, that schools and the education system have not kept pace with these developments in the larger society (Bennett, 1996; Johnson, 1997; O'Neil, 1995). Thus, a gap exists between what students learn in schools and what they need to know to function effectively in the information age. Greening (1998) suggests that the education system has been left behind and that there is a "chasm between the learning that takes place in educational settings and that which occurs in wider society" (p. 23).

The result has been an increased demand by parents, legislators and the work world to accelerate the integration of information technology into the curriculum at the school level (Johnson, 1997). All levels of the education system have been under pressure to adopt and implement these new technologies in the classroom. Teachers and school leaders have been bombarded with the promise of these information technologies to transform schools (Van Dusen & Worthan, 1995). Other critics have written volumes extolling the virtues of specific methods to evaluate software and design infrastructure components (Burke, 1995) and to train teachers (Cates, 1995; Faison, 1996).

In response, schools and school systems have invested enormous amounts of resources to integrate information technology into its curriculum. Many have done so without achieving the results anticipated. Much of the recent discourse in the information technology literature has documented how little impact these efforts have had upon life in the classroom (e.g., Johnson, 1997). Fortunately, much effort has gone into examining why implementation efforts have failed (Faison, 1996; Schofield, 1995; Willis, 1993), and what conditions are likely to lead to more successful integration efforts in the future (Cates, 1995; Hancock, 1997).

In the recent literature, the focus has been shifting from technical aspects such as hardware, software, set-up arrangements and technical training to the larger issues involved in integration. The new focus has been on the paradigmatic shifts (Bennet, 1996;Tapscott & Caston, 1993) required for successful efforts in integration. There have also been attempts to illustrate how integrating information technology can be used as a catalyst for reform efforts (e.g., Salpeter, 1998), and the need for them to be closely related to whole school change efforts (Collins, 1991).

This paper will explore the issues of integration in this context. It will first offer a definition of information technology integration in schools and develop a rationale for its inclusion in the curriculum. This will be followed by an examination of various factors that impact upon successful integration. Among these factors, leadership in schools has emerged as a critical element determining the success of integration efforts (e.g. Dede, 1992). This paper will conclude by identifying specific ways leadership in schools can enhance successful integration of these new technologies into the curriculum. It will do so in the context of the latest calls for school reform and the process of social change (Fullan, 1990). It also pays specific attention to shifting paradigms (Tapscott & Caston, 1993), and the five disciplines of a learning organization (Senge, 1990). The intent is to demonstrate leadership activities that can aid the process of changing industrial age schools into information age schools (Hancock, 1997), by integrating these new technologies into its daily practices.

Integration Defined

In the 1980's much of the literature in the field of information technology was concerned about technical and single-issue problems of implementation. There were problems and solutions advanced that involved acquiring hardware and peripherals, evaluating software, defining and measuring technology library, providing technical training, and keeping up with new developments in the field (Lockard et al, 1990; Willis, 1993). Fewer critics today question if computers, video, and telecommunication technology will find its way into the schools. No

longer are researchers fixated on compatibility of systems, appropriate software, and technical expertise. While these are still important concerns, the answers are very context-specific and must emerge out of more encompassing questions surrounding a larger view of integrating information technology in the classrooms (Willis, 1993).

In the 1990's, these prior issues have come to be known as "infusion" efforts (Lockard et al., 1990), meaning that schools were concerned mainly with acquiring these new technologies, providing brief workshops in technical training for teachers, and then expecting full integration. Recognition that schools often change very little as a result of acquiring information age technologies has led to a new focus for discussions about integration today.

What then, is integration? First of all, it refers to ways that information technology can be used to achieve the goals of the curriculum (Schofield, 1995). It is concerned with employing these new technologies in a variety of diverse settings including classroom, laboratory and resource center designs. It assumes a view of information technology as a partner in the development and delivery of new and different education experiences for students. It is concerned with how professionals in the education system use these new technologies to create a professional bond among teachers and administrators that can alleviate much of the isolation felt in the system today. Finally, it focuses upon students using information technology to become involved in a new system of knowledge that will enhance higher order cognitive development, collaborative learning, more individualized programs, and alternative assessment methods (Hancock, 1997).

Information technology integration occurs when these new technologies are used in so many different ways and to fulfill such a wide range of functions that they become invisible. Invisible that is, in the sense that they are so much a part of the process of teaching and learning that they are accepted as a fundamental part of education, much the same way as paper notebooks and pencils are regarded today.

Rationale for Integration

Such an all encompassing role for information technology requires some reflection upon why integration should be a goal for education. Advocates, nay-sayers, and cautious optimists have all contributed to the discussion on why information technology should be integrated in schools today. The concern here is to develop a rationale for its inclusion and will therefore examine the common themes inherent in the views of integration advocates. Four common elements involving changes in society, potential impact upon teaching and learning, collaborative structures, and emerging technologies, are included in most arguments for the integration of information technology in schools (e.g., Schofield, 1995).

Changes in Society

Most students in our schools today interact with a multitude of information media. It is likely that they will continue to do so at an increasing rate throughout their lives (Rifken, 1995). From schools, they will enter into an environment where business and other workplaces have retooled with advanced technologies and comprehensive information systems. Therefore, if schools are going to perform one of its chief functions - - that of preparing students for the future (Shlechter, 1991)--, it is essential to integrate information technology into the curriculum.

Industrial age schools that focused upon transmitting a body of knowledge and a pre-determined set of skills to students can no longer serve this function (Hancock, 1997). We now need information age schools where students use and interact with information technology on a daily basis. They do so in many ways that enable them to meet high academic standards, while solving challenging problems in real world contexts. Consequently, students who graduate from information age schools will not be in awe of these new technologies but will be able to use them to enhance their social and economic conditions in the future.

Potential Impact upon Teaching & Learning

Reform advocates have long called for different teaching practices and a different view of the learning process in schools (e.g.,. Goldberg & Richards, 1995). Information technology

integration advocates submit that these new technologies can greatly enhance the required changes in teaching and learning (Cates, 1995; Stoddart & Niederhauser, 1993). It can do so by enabling teachers to adopt roles such as guiding, coaching and facilitating. Spending less time dispensing information in a didactic instructional mode (Schofield, 1995), will allow teachers to provide more individual help to students. Evidence has shown that these new roles for teachers encourage them to examine new instructional strategies and evaluate emerging issues in pedagogy (Cates, 1995).

Student learning can also be improved using these new technologies. Advocates say that information technology tools can enhance the development of higher order thinking skills (e.g., Schofield, 1995). It can do so by providing ample opportunities for students to assimilate, communicate and evaluate information that is readily available from a variety of sources in an environment that uses these technologies frequently. Improved problem solving skills, as well as the development of higher-order cognitive processes are vital assets for success in the information age.

Collaborative Structures

Cooperation and more collaborative efforts among stakeholders in education are key elements in school reform (Manges & Wilcox, 1997). Information technology has a vast potential to improve communication and allow for more collaborative efforts throughout the system (Bennett, 1996). Using a variety of information sources, administrators can communicate with parents, teachers, and other administrators. Teachers can communicate with colleagues from around the world on projects and new ideas in the teaching process. More importantly, these new technologies can help build strong positive relationships between the school, the home, and the community. This is accomplished when parents and other community members have access to libraries, homework hotlines, and school bulletin boards. It is aided by opening communication channels between teachers and parents via electronic mail boxes, e-mail and voice mail. Increasing the quantity and quality of communication channels also increases the chances for collaborative efforts in the school's efforts to provide a quality education to students.

Finally, students quickly learn the value of collaboration on projects when so much information is available using information technology tools. This de-emphasis of competition in the classroom and more emphasis on the need for teamwork will serve them well in the emerging workplace of the coming century. It also illuminates one of the paradigm shifts required if education is to achieve real reform (Manges & Wilcox, 1997).

Recent and Emerging Developments

Integrating information technology is becoming even more important as new and anticipated versions of these technologies become available. New peripherals, more advanced software packages, and highly interactive systems are becoming more and more adaptable for use in the classroom. "Information technologies are going to get smarter and cheaper in years to come, and far more capable of integrating a wide range of mental and physical activities" (Rifken, 1995, p. 158). Schoefield (1995) reiterates this view when she claims that:

> the rapidity with which computer technology itself is now evolving means that one must consider not only the probable impact of the kinds of technology that are now available, but the likely impact of successive generations of computerized devices whose capabilities may only be foreshadowed currently in schools. (p. 228)

As the development and adaptability of these new technologies becomes more available to schools, it is reasonable to expect that information technology will play an ever increasing role in efforts to reform education. Schools now have a responsibility to explore how integration can best be achieved. Efforts to integrate these new technologies must be cognizant of the complex and enormous issues that can impact upon successful integration. Some of these factors will be examined next.

Factors That Impact Upon Integration

Introduction

The enormous potential of information technology to impact upon schools remains largely untapped (Schofield, 1995). Information technology advocates point to poor implementation programs and a lack of integration as the major reasons why these technologies have failed to live up to expectations (Stoddant & Niederhauser, 1993). Even a cursory review of the literature will reveal that prevalent use of these new technologies does not occur as an event in schools (Bennett, 1996). As Willis (1993) points out, it involves much more than offering a few short courses in operating a personal computer, a few tutorials in selected software, and then waiting for schools to integrate these new technologies. Instead, integrating information technology into the curriculum must be viewed as "an ongoing process which can be done poorly, effectively, or not at all" (Willis, 1993, p. 27). In the education system today, it appears that more often than not it is done poorly or not at all.

In response to this lack of success of integration efforts, a number of factors that are "barriers" to the wider use of information technology have been compiled (Schofield, 1995; Stoddart & Niederhauser, 1993; Willis, 1993). In addition, a number of writers have proposed factors that can have a positive impact, and thus are "encouragers" of information technology integration (Hancock, 1997; Mengendoller, 1997; Ritchie & Wiburg, 1994). These factors are summarized below under the headings: funding, quality and design, resistance to change, support for change, teacher training, integration plan, and leadership.

It must be remembered that integration is a process and so these factors are all very much related and interdependent. Funding, for example, may impact upon teacher training as well as the selection of hardware and software which, in turn, may impact upon the design and the integration plan. For demonstration and organizational purposes, each of these factors are explored separately in terms of the impact they have upon integrating information technology in

schools.

Funding

There is little doubt that the lack of adequate funding has affected integration efforts in schools (Kearsley, 1998). Obviously, if lack of funds results in limited access to information technology tools, then integration cannot succeed (Sterns, 1991). In schools where teachers and students have access to these new technologies for only a few minutes or a few hours a week, there can be no integration. Johnson (1997) views the acquisition of more computer related equipment for classroom use as a necessity for more successful integration efforts.

Stoddart & Neiderhauser (1993) contend, however, that there is more to funding than the mere acquisition of materials. Information technology tools, in the absence of funding for teacher training and other supports, is not likely to lead to integration. In addition to acquiring the technology, Schlector (1991) claims that there must be sufficient funding for maintenance and up-grading, for teacher training, and for ongoing support. Hence, schools hoping to integrate information technology must access funding for hardware, software, and other required peripherals. Funding must also be available to fix broken equipment, replace or update older equipment, and purchase new and more advanced technologies as they become more accessible to schools.

Schools must also have funding to provide exploration and training activities for teachers expected to use these new technologies on a daily basis. Finally, enough funding must be available for support personnel to help administrations, teachers, and students when and where they need it. Teachers, in particular, must have this technical advice on the spot and readily available in order to get past the initial frustrations of using unfamiliar tools and techniques in the classroom (Schofield, 1995). Successful integration then, is highly dependent upon sufficient funding in appropriate proportions to address all of these concerns.

Quality and Design

A number of issues surrounding the quality and design of the information technologies themselves can impact upon the degree of integration. First, the hardware and peripherals must

be modern and capable of interfacing with the best available software packages (Goldberg & Richards, 1995). Second, the software selected and used by teachers must lend themselves to meeting the goals of the curriculum (Schofield, 1995). Finally, the information technology tools must be organized and situated in schools in ways that make it widely accessible for student and teacher use on a daily basis (Collins, 1991).

In some schools, the urgency to acquire these new technologies combined with the lack of a clear vision for implementation, led to the purchase of tools that are outdated and have no potential to become integrated into the curriculum (Lockard et al., 1990). In other cases, inadequate funding resulted in the selection of less expensive equipment in order to purchase more. The result has been more equipment that cannot be used by teachers and students in the classroom. In the absence of technology literate individuals, expensive peripherals and inappropriate software packages often end up in schools. Expensive equipment that has no relevance for teaching often become disincentives for teachers to further explore potential benefits of integrating information technology into the curriculum (Schofeild, 1995).

Furthermore, the software selected by schools often do not fulfill the promises made by the suppliers. Software selection must be done in cooperation with the teachers who will be using it as well as in consideration of how it can be adapted to achieving stated goals. Many critics (e.g., Stoddart & Niederhauser, 1993) note that much of the early software available to schools emphasized rote drill or skills practice. Software that presents information for students to assimilate, that is very singular in subject matter, or that is designed to be easily tested is not likely to contribute much to student learning (Means et al., 1993). Hence it does not enhance the kind of integration envisioned for information age schools.

One other problem with software is that it is often evaluated on the basis of how well it can fit into current practices of teaching and learning. Thus software designed to help develop inquiry skills, to enhance creative thinking, or to generate real world problems may not be selected because it does not improve learning in a didactic - transmission approach to the curriculum (Collins, 1991). This software selection issue is very much related to teacher training

and support in the schools.

Finally, the physical arrangement of information technology in schools can impact upon successful integration. Collis (1988) illustrated advantages of various set-ups in labs, classrooms libraries and learning assistance centers. There is no one best design. The most appropriate design must emerge out of the needs identified by teachers and students with plenty of technical and professional support. Recently, network systems involving a combination of classroom setups with laboratory or resource rooms seem to have much support (Martin & Taylor, 1997). Ensuring that the quality and design of these new technologies matches the needs of teachers and students in the school can greatly enhance integration efforts.

Resistance to Change

Efforts to integrate information technology in schools may be severely hampered by resistance to change in the education system. Teachers are very hesitant to adopt these new technologies which may expose them to potentially embarrassing situations, which undermine their sense of competence, and which can negatively impact upon classroom control (Schofield, 1995). Also, teachers who are comfortable with the old ways of doing things, and have good relationships with students and parents, are reluctant to become involved in using these new technologies in the classroom. The emotions of fear, anxiety, and phobia expressed by teachers have to be considered seriously by those who advocate wholesale integration of information technology. Insensitive reaction to concerns about low levels of technology competence, combined with anxiety about working with new and unfamiliar machines can thwart the integration of these new technologies (Schofield, 1995).

In addition to individual resistance, the education system itself is quite conservative in nature (Marcinkiewicz, 1991). The secondary school curriculum is still dominated by lecture, texts, and other passive forms of learning (Means et al., 1993). Stoddart and Neiderhauser (1993) report that despite new approaches to learning like constructivism, education is still bogged down in the behavioral paradigm of the 1960's. This stagnant inertia of the system must be overcome before information technology can be fully integrated. On a more positive note,

Sheppard and Brown (1998) report that schools do change and improve when sufficient attention to these integration efforts are combined with a number of other interrelated factors.

Support for Change

Information technology integration is enhanced in an environment where there is much support for change. Support can come from legislators, the business community and the general public as well as from those in the education arena. These supports can be in the form of funding, guidance and training for teachers, and professional and moral support for all individuals who struggle to integrate these new technologies in schools today (Cates, 1995). Schofield (1995) reports that in the absence of someone to encourage and facilitate their efforts, many teachers "never really tried to explore what use they could make of computers in instruction and those who did try often became discouraged" (p. 128). If teachers strive to integrate information technology into their classrooms, they must be able to assume that if hardware or software problems arise, someone will be available to help in a timely manner. Willis (1993) agrees and expands the idea by suggesting that consultants could be "front-line assistants and trouble shooters for teachers" (p. 26). He goes on to argue that these assistants must have an education background and experience using information technology in education. Also, Brown and Sheppard (1997) document how teacher librarians are expected to provide this support. As the school's media experts, part of their role is to be a trainer of technical skills for teachers and students.

One other option for teacher support is to develop electronic hotlines and e-mail connections for teachers to access help for technical problems. Those same links could be used to communicate with support groups and other teachers about integration issues. Schools and teachers who have access to qualified personnel who understand both information technology and pedagogy (Faison, 1996) are more likely to succeed in integrating these technologies into the curriculum.

Teacher Training

Many critics have suggested that the lack of high quality teacher training is a major factor

impeding the integration of information technology in the classroom (Faison,1996; Kearsley & Lynch, 1994; Mergendoller,1997; Stoddart & Niederhauser, 1993). Teacher training and professional development strategies are essential if teachers are to take advantage of the instructional opportunities that information technology affords. The issues here involve more than technical training, although that is important. Equally important is the need for teachers to understand how and why these new technologies can become fully integrated to achieve the goals of education (Cates, 1995).

Successful training programs offer teachers extended opportunities to learn, to practice, and to integrate what they learn (Schofield, 1995). They also allow for informal coaching and structural presentations in a supportive environment (Mergendollar, 1997). Motivational factors, competence levels, and individual confidence are all important considerations inherent in teacher training if integration is to succeed (Scoffold, 1995). More than all of this though, Means et al. (1993) emphasized the need for professional development to include a component aimed at changing teachers' beliefs about the teaching and learning process. Within this component, teachers would examine current theories about teaching and learning. This would enable them to understand the value of using information technology to introduce profound and transformative changes to the curriculum.

These changes include a shift from teacher-directed work to student exploration that builds on existing knowledge. It would also mean a shift from didactic teaching to interactive modes of instruction where students are more active participants in the learning process. It could encourage schools to switch from brief class periods devoted to single subjects to longer blocs of time devoted to several disciplines as well as real world problems. Finally, it would involve shifting the focus from individual work in competitive environments to more collaborative efforts among groups of students (Means et al., 1993).

Willis (1993) also emphasized this need for a multi-focused approach to teacher education. In his model which he calls "possibilities first, then basics, then just-in time-learning and support" (p. 22), the initial goal would be to expand teachers' awareness of instructional

possibilities. Then the basic strategies involving information technology integration would be the focus, followed by on-going support. Teachers would thus be trained to integrate these new technologies in five overlapping stages that would include: broadening experiences, exploration activities, planing-consultation, just-in-time training, and on-going support (Willis, 1993).

Either of the above models requires more resources, support and funding than have previously been forthcoming from the education system. They are necessary though if information technology is going to be integrated to such a degree that its full potential to impact upon the education system is to be realized.

Integration Plan

There are those who argue that information technology will not become widely integrated in schools that have not developed a plan for implementing it into the curriculum (e.g., Lockard et al., 1990). Such a plan would be developed with input from all stakeholders and communicated throughout the system so that the goals of the school and those of individual teachers do not contradict each other. Teachers who use information technology tools mainly for constructing tests, compiling student records, and other administrative duties, for example, may not be contributing to the kinds of integration anticipated by the administration or the school district.

A carefully developed plan can enhance integration efforts in a number of ways: it articulates the vision of the school and the district; it sets the tone for the degree of commitment by different levels of the system; and it avoids misconceptions among stakeholders about the ultimate aims of integration. These plans provide a "framework, without excessive specificity" (Lockard et al., 1990), yet they must focus on providing conditions for intended change to evolve.

Defining and communicating the aims and goals to be achieved by integration is one part of the plan. A systemic approach to the process of change must also be built into the plan (Wiburg, 1997). This systemic approach to change includes involvement in the school culture in such a way that instructional conversations among teachers, administrators, and community

representatives ensure unity of purpose, vision, and focus (Schofield, 1995). Uniting these two components can have significant positive impact upon successful integration of information technology into daily classroom practices.

Leadership

Effective leadership is an important factor in determining the success of any innovation in education (Bennett, 1996). It is even more critical for successful integration of information technology in schools today (Becker, 1993). Rieber and Welliver (1989) recognized that effective leadership was needed to enhance the transformation of our education system by taking advantage of the potential of information technologies. Others claim that the success or failure of integration efforts rests on the shoulders of school leaders (e.g., Solzano, 1992).

Why is leadership such a critical factor in integration efforts? Lockard et al.(1990) claim it is because the task of integrating these new technologies is enormous, that there are many issues to consider and many decisions to be made. Dede (1992) supports the claim that leadership covers a whole gamut of behaviour and ideologies from skillful management to careful political maneuvering to the facilitation of others actions with effective communication and role modeling. Given such large conceptions of leadership, the possible impact it can have upon successful integration is obvious. Namely, leaders influence, make decisions, provide supports, and model behaviour that can eventually lead to the achievement of desired goals.

Bennett (1996) takes this leadership issue one step further. She claims that if schools are going to successfully integrate these new technologies, "the meaning of educational leadership, and the role of the school principal within a technological paradigm must be redefined" (Bennett, 1996, p. 57). The need to provide students with the necessary skills to succeed in a rapidly changing, high-tech, information society demands leaders who are knowledgeable users of technology and effective managers of these new technologies in their schools. Hence school leaders "cannot succeed by using management and leadership strategies that do not support the integration of computer technologies into classroom practices " (Bennett, 1996, p. 58).

It is important to recognize that school leadership in the new paradigms of education

involves more than the school principal (O'Neil, 1995; Sheppard & Brown, 1998). It is also

more than trained technical support or well-meaning technology literate teachers in a school.

Instead, leadership must be viewed as teams who collaborate efforts to achieve intended goals.

Administrators, teachers, students, parents, community members, and school district personnel

may all be part of groups that provide leadership in the integration process. This does not

diminish the role of the school principal, it simply changes the focus of the position. Schools

where leadership teams made up of diverse groups, function alongside, and in conjunction with,

individual leaders throughout the system are more likely to prosper from successful integration

efforts.

The Role of Leadership in Integration

Introduction

Having examined the different factors that impact upon information technology

integration in schools, and identified leadership as a key factor that can potentially influence

many of the others, it is useful to examine the leadership factor in more detail. What role does it

play in the emerging vision of information age schools? An appropriate starting point is to

consider the implications of the following observation by Jeremy Rifken (1995), President of the

Foundation on Economic Trends and author of *The End of Work*:

> As long as management attempted to graft the new technologies onto traditional
> organizational structures and processes, the state-of-the-art computer and
> information tools were stymied, unable to perform effectively and to their full
> capacity. Recently however, corporations have begun to restructure to make it
> compatible with the high-tech machine culture. (Rifken, 1995, p. 6)

Rifken's point that corporations needed to change and become more "compatible with the high-

tech machine culture" applies equally to schools. Within this context of change and education

reform, the leadership role of school personnel for the integration of these new technologies in

schools is enormous if information age schools are to be developed from industrial age schools.

According to Hancock (1997), information age schools are characterized by: interactivity, self-initiated learning, a changing role for teachers, central participation by media-technology specialists, continuous assessment, and a changed environment.

Willis (1993) describes five overlapping stages of activities that must occur in staff development for the integration of information technology into the curriculum. They include broadening experiences, exploration activities, planning and consultation, just-in-time training and on-going support. With the addition of a sixth stage, assessment, these overlapping activities can be adapted to describe the process a school must go through in order to integrate information technology to such a degree that it becomes an information age school.

This paper will now examine the role of leadership in its efforts to initiate, facilitate, support and evaluate the process of integration. It will do so by demonstrating the functions that leadership must perform during each of the six overlapping stages identified above. Throughout the discussion, specific actions and functions of leadership are explored in the context of the many paradigm shifts (Tapscott & Caston, 1993) inherent in the school reform literature. References are also made to the five disciplines of a learning organization described in *The Fifth Discipline: The Art and Practice of the Learning Organization* (Senge, 1990). The aim is to explore the role of leadership within each of the six stages of a process that can lead to school reform by fully integrating information technology into its curriculum. It is anticipated that the product of these efforts will be the development of an information age school.

Broadening Experiences

In order to initiate the process of integrating information technology, stakeholders need to become aware of the potential for these technologies to impact upon education (Bennett, 1996). This awareness must be developed in the context of the current realities of how information technology is being used in the school. The role of leadership in this stage is to set the agenda, to raise awareness levels among the stakeholders, and begin establishing an environment for change.

First, leaders can start with raising the issues at staff meetings, parent gatherings, and student assemblies. This can be reinforced in parent newsletters and brief "overview" brochures. In this way leaders demonstrate the importance of the issue, show how it affects everyone in the system, and illustrate the dedication, time, effort, and teamwork required to achieve integration. Having a systemic view of the school will be essential for leaders to begin the process (Goldberg & Richards, 1995). Raising awareness levels of the technology itself then becomes the focus of the leadership role. Invitations to specialists from the community, the school district office, or from within the school to demonstrate information technology uses in the curriculum to students, teachers and parents are all helpful. The aim is not to be too technical; rather, to demonstrate various information technology tools and establish a connection to improved teaching and learning in the classroom.

Diverse groups of teacher librarians, technology education teachers, classroom teachers, students, and district officials could become responsible for providing awareness to different capabilities of CD-Roms, scanners, and software packages. Specific demonstrations of Vernier Software for physics experiments, mathematics graphing tools, multimedia publishing, and Internet research techniques for students, parents and teachers would show the possibilities for a more relevant education. Specific demonstrations for teachers at this stage might illustrate administrative uses such as keeping records, constructing exams and generating new and different worksheets.

At this stage teamwork and the need for collaborative efforts among all groups are important concepts to develop. It will be critical for leaders to make use of information technology as much as possible. Exposure to the large potential of these new technologies for all groups involved in the school is the main function of leaders at this stage of the process.

Exploration Activities

In order to integrate information technology into the curriculum, stakeholders need to have more than a tacit knowledge of the technologies themselves. Before integration of these new technologies can begin, "people must understand its operation as well as its potential, and at

high enough levels that they can make meaningful decisions" (Cates, 1995, p. 73). Hence, beyond raised awareness levels, teachers and students need opportunities to explore further the possibilities of these new technology tools. Providing ample opportunity for these hands-on explorations in a non-threatening, supportive environment will be an important function of leadership in this stage.

One approach will involve setting up teams of teachers, students, and parents who have different levels of expertise in using these new technologies. The message will be for each team to collaborate in ways that will raise the effective - use levels of all its members. Individuals who are apprehensive or who resist are urged and supported by leaders in each group as well as by the administration of the school. Overcoming initial fears and technophobia should be directly addressed if these problems surface in this stage of the process

Leaders in each team need to ensure that everyone gets some hands-on training. Software demonstrations by teachers for non-users are elevated to trial projects where reluctant staff members actually try out some uses of these new technologies in their work. Teams could also access more resources from the Internet. All members of the team go through the mechanics of logging on to the Internet and are supported in their initial attempts to use e-mail and other communication applications of these technologies. There are many benefits here since the individuals who are demonstrating and supporting also learn valuable lessons as well. Collaboration and teamwork are thus encouraged among all members. Teams of teachers, students, and parents gathering around a workstation to find information that interests them about sports teams, home remedies or other individual interests enables valuable hands-on-learning experiences.

This exploration stage can be more successful if students and teachers have computers at home. If they do not, there is much support for allowing teachers to take computers home on weekends, during breaks, and even over the summer (Lockard et al., 1990). This could be expanded so that a number of computers would be signed out to teachers on a rotating basis. When people can explore the potential of information technology in the comfort and security of

their own home, with plenty of technical expertise available from team members, valuable hands-on-training can result.

While exploration and hands-on-training must be an ongoing stage, at some point it becomes necessary to move on through the process. Having demonstrated the potential of these new technologies to impact upon education and provided a number of diverse hands-on experience opportunities, leaders must begin to move toward full integration of these new technologies into the curriculum.

Planning and Consultation

The two preceding stages were described before the planning and consultation stage for specific reasons. First, schools cannot build a vision of integration that includes infrastructure considerations and instructional strategies before stakeholders have a working knowledge of information technology and have some understanding of its potential to impact upon teaching and learning in the school community. Second, the leadership role in the planning and consultation stage is greatly enhanced by using these new technologies (Willis, 1993). Communication and information gathering for different teams strengthens skills and allows them to access information about issues that arise. It also allows them to communicate with other schools who are at various stages of technology integration.

At this stage, the leadership role is about "building a sense of commitment in a group, by developing shared images of the future they seek to create, and the principles and guiding practices by which they can arrive there" (Sheppard & Brown, 1998, p. 14). It is concerned with enhancing the collective capacity of people to create and pursue their overall vision (O'Neil, 1995). Leaders in this stage are facilitators, coaches, and managers who help different groups and teams build consensus on issues related to the development of a vision.

Specific activities for leaders in this stage include information gathering from the Internet, from the district office, from the Department of Education, and from other schools that have already developed plans for technology integration. It also involves information gathering by diverse groups related to different aspects of the plan. For example, while one group of

parents, teachers, students and community experts examines specific ways that information technology is being used in classrooms, another group may examine infrastructure issues and funding for acquiring information age technology. Yet a third group may be responsible for exploring training plans that have been used elsewhere to help teachers use these new technologies in innovative ways in the classroom.

School leadership, involving the principal but perhaps also including school council members or district personnel, need to coordinate the results of the groups' efforts so that a long-term plan can emerge. This plan evolves from a process where teams have defined current reality, identified specific needs, generated a number of possibilities, and selected a long-term strategy for implementation to be pursued by the school (Collis & Anderson, 1994). A team of leaders can then assimilate the plan and communicate it throughout the school community.

In this stage of the process, leaders must work to build a common understanding of the paradigm shifts (Bennett, 1996) inherent in school reform. Stakeholders who do not understand something about the new focus on inquiry-based learning, learner-directed activity, changing roles for teachers, and increased parent and community involvement, may have difficulty understanding the vision that emerges from the groups' efforts. Brochures, presentations, and repeated references to these important concepts by leaders at all levels of the system will be needed throughout this stage of the process. The plan that emerges must incorporate a vision with these shifts in mind, if integrating information technology is going to lead to the development of an information age school.

Just-In-Time Training

Specific teacher training needs will emerge out of a well developed plan for integrating information technology in the school. These needs will be concerned with using these new technologies in the classroom of an information age school. Furthermore, teachers will need to receive this training near the time and place in the curriculum where they will be using it. For successful integration to occur, their needs must be identified and resolved as expedient as resources permit.

In this stage, leaders arrange for teacher training time and identify sources of expertise that can be made available to teachers. These training sessions may involve teleconference, e-mail or contact with special interest groups. It may also involve arranging for experts from the community or the district office to help teachers with technical or pedagogical issues that arise. Just-in-time training may also be provided to parents in the resource center by students and teachers during afternoons or weekends. In Brown and Sheppard's (1997) study, such just-in-time-training was provided by qualified teacher-librarians. This can help parents help their students and teachers in a technology rich environment and contribute to further integration of these technologies into the total school community.

On-Going Support

While on-going support is vital throughout every stage of the process, it becomes even more critical as the other stages are more developed. During the actual integration stage, the support the process receives will determine the success of the total change process (Schofield, 1995). These supports can be in the form of money, time and professional help as well as moral support, encouragement, motivation, and other incentives. Leaders at all levels in the system have an important role in providing these supports when and where they are most effective.

The school district and administration must always be looking for ways to increase the level of information technology literacy on the staff. As teachers retire or leave the school, new teachers hired should have training and expertise in working with information technology and must be willing to work as part of a team to ensure integration into the curriculum (Sheppard & Brown, 1998). In addition, administration must be willing to use all possible means to acquire funding so that essential tools for integrating these information technologies are available to the school. There must also be commitment to providing technical advice as it is needed by the school community.

In addition to resources though, encouragement and incentive kinds of support are also necessary (Evans, 1996). Leaders need to constantly encourage with words and actions that

show appreciation for efforts that enhance integration. Bulletin board notices, newsletters, and other communications should always report specific actions that contribute to achieving integration. Incentives to take extra courses in related fields and even partial payment of tuition for teachers to enroll in correspondence courses are also ways of providing on-going support (Lockard et al., 1990).

Other means of support could be provided using the information technology tools themselves. By developing electronic support groups, homework hotlines and access to local networks, leadership can provide moral support to teachers and students. When people work together with the understanding that their collaborative efforts can achieve more than the sum of their individual efforts (Manges & Wilcox, 1997), the possibility for developing an information age school is increased. Therefore, encouraging teamwork leads to moral support and contributes to the goals of school reform.

Leaders in schools can provide support throughout the school community by modeling desired behaviors and actions. Using the tools, patiently demonstrating instructional strategies to others, and working as part of a team are all powerful ways to provide support. When leaders are visible and modeling such behaviors, it demonstrates commitment to the plan and the vision of integration developed by the community. This encourages others to participate and support the required changes throughout the curriculum.

Assessment

In the process of becoming an information age school, assessment itself is not a separate stage. It is a part of every stage and must occur throughout the total process. Assessment here refers to how schools determine the degree to which stated goals and objectives are being met. It involves student assessment and how patterns of student achievement are used to determine future efforts in the school. The leadership role in this process is to make decisions about what gets measured, how it is measured, and the implication of the results for future endeavors.

Throughout the overall process of integrating information technology, the leadership role involves coordinating group discussions and evaluations of successes and setbacks that occur

along the way. Leaders can encourage and guide groups to develop literacy continuums and skills checklists. Informal discussions with students, teachers, and parents, as well as formal assessment strategies such as conferencing and observation of teaching practices and student learnings, are all part of the leadership role in assessment.

In particular, leaders need to always pay sufficient attention to student achievement to ensure that the focus of integrating information technology is directed to improving student performance (Cates, 1998). Reporting, interpreting and discussing trends in student achievement has always been an important part of the leadership role. Now, however, new methods of assessment may be needed to determine student abilities in a more inquiry-based, problem-solving, learner-directed education, that reform advocates hope will emerge as schools become more successful in integrating these new technologies into the curriculum (Hancock, 1996). These new methods may include individual portfolios, school report cards, and continuums of expertise in using these new technologies.

Leaders and teams will have to continue to analyze school performance on standardized and criterion referenced tests, while advocating the need for other non-standard assessment tools. Communicating these results to students, teachers and parents allows leaders to accomplish several goals. First, leaders can report success or improvements for encouragement. Second, leaders can use analysis of the results to determine future directions. Finally, leaders can demonstrate the limitations of the assessment tools to encourage groups to develop new ways for measuring achievement in the information age school. One such method that may emerge is the incorporation of action research into the school. Teams from the school in cooperation with outside research interests can be very advantageous in helping school leaders assess the performance of school programs.

Leaders must also encourage reflection, communication and discussion about the success and failures of integrating information technology into the curriculum. The answers to several key questions must be considered. Has integration contributed to a more relevant and productive education for students? Has it contributed to the development of a more collaborative enterprise

and enhanced the notion of life long learning in students? Has the school become a learning organization and achieved its vision of integration set forth in the plan? The answers to such questions will involve careful analysis of various sets of data compiled by teams. It may be helped by tracking students for a number of years after they graduate. Patterns that emerge out of this tracking system may enable schools to make observations about the successful integration of these technologies.

Now that all six stages of the process has been discussed and the role of leadership within each stage has been explored, it is important to remember that the stages very much overlap and continue throughout the process. This paper did not attempt to provide a recipe or a "quick fix" for leaders. Instead it hoped to draw attention to the many complex issues that need to be considered before schools can successfully integrate information technology and the critical role that leadership must play in initiating and facilitating a process to develop an information age school.

Conclusion

This paper opened with the observation that the education system has not kept pace with society in making use of available information technology. It went on to define integration in terms of how information technology should be viewed if schools hope to tap the enormous potential of these new technologies. There are, however, several key factors that determine the success of integration efforts . A number of these factors were explored in detail by demonstrating how they impact upon successful integration of information technology into the curriculum.

Leadership in schools has emerged as a key factor in determining the success of information technology integration. Hence the last part of this paper explored the role that leadership can play in integration efforts. It did so in the context of a process by which a school can develop the characteristics of information age schools suggested by Hancock (1997). It also considered how a school becomes a learning organization and a community of learners (Senge,

1990) by focusing on a number of key paradigm shifts inherent in school reform efforts of the 1990's (Bennett, 1996).

As any practitioner in the field of educational leadership knows, there are no "quick fixes" in the realm of education reform The issues are often complex, and many intertwining variables impact upon change efforts. Having a systemic view of the change process and facilitating an environment where team leadership and collaborative efforts are the norm, will increase the likelihood of achieving school reform. This is the great challenge for leadership in schools today -- to create a community of learners in an information age school by integrating information technology into its daily practices.

References

Baron, J., & Kallick, B. (1985). "What are we looking for and how can we find it?" in A. Costa (Ed.), *Developing Minds: A Resource book for teaching thinking* (pp. 279-287). Washington, DC: Association for Supervision and Curriculum Development.

Bass, B.M. (1985). *Leadership and Performance Beyond Expectations*. New York: The Free Press.

Bass, B.M. (1990). *Bass & Stogdill's Handbook of Leadership: Theory, Research and Managerial Applications*. 3rd ed. New York: The Free Press.

Bass, B.M., & Avolio, B. J. (1990). "Developing transformation leadership: 1992 and beyond". *Journal of European Industrial Training*, 14, 21-27.

Bass, B.M. & Avolio, B.J. (1993). "Transformational Leadership: A Response to Critics" in M.M. Cheners & R. Ayman (Eds). *Leadership Theory and Research: Perspective and Directions*. (pp.49-80), San Diego: Academic Press.

Becker, H.J. (1993). Teaching with and about computers in secondary school. *Communication of the Association for Computing Machinery*. 36(5), 69-72.

Bennett, C.K. (1996). Schools, Technology, and Education Leadership: A Framework for Change. *NASSP*, 80 (577), 57-65.

Bennis, W.G., & Nanus, B. (1985). *Leaders: The Strategies for Taking Charge*. New York: Harper & Row.

Brown, J. (1993). "Leadership for School Improvement". *Emergency Librarian*, 20(3), 8-20.

Brown, M.C. (1982). "Administrative Succession and Organizational Performance: The Succession Effect". *Administrative Science Quarterly*, 27, 1-16.

Brown, J. & Sheppard, B. (1997). Teacher-librarians in learning organizations. In L. Lighthall & K. Haycock (Eds.), *Information Rich but Knowledge Poor?* (pp. 197-216). Seattle: International Association of School Librarianship.

Burke, B. (1995). Designing the Technology Facility of the Future. *The Technology Teacher*, (55(3), 3-8.

Burns, G.M. (1978). *Leadership* New York: Harper & Row.

Cates, W.M. (1995). The Technology of Educational Restructuring: Planning for Change in Teacher Education. *Computers in the Schools*, 11(4), 65-87.

Cohen, D. (1988). Educational Technology and School Organization in R. Nickerson & P. Zodiates (Eds.), *Technology in Education: Looking Towards 2020*. Hillsdale, NJ: Lawrence Erlbaum.

Collins, A. (1991). The Role of Computer technology in Restructuring Schools. *Phi Delta Kappan*, 73(1), 28-36.

Collins, B. (1988). *Computers, Curriculum and Whole-Class Instruction* Belmont, CA: Wadsworth.

Collis, B. & Anderson, R. (1994). Educational Technology: Issues and Innovations. *Computers in the Schools*, 11(2), 55-70.

Costa, A. (1985). How can we recognize improved student thinking? In A. Costa (Ed.), *Developing Minds: A resource book for teaching thinking* (pp.288-290). Washington DC: Association for Supervision and Curriculum Development.

Dede, C. (1992). Leadership without followers, *The Computing Teacher*, 20(6). 9 - 11.

DePree, M. (1989) *Leadership is an Art*. New York: Doubleday.

DeVillar, R., & Faltis, C. (1991). *Computers and Cultural Diversity: Restructuring for school success*. Albany, NY: State University of New York Press.

Ely, D.P., & Plomp, T. 91989). The Promises of Educational Technology in D.P. Ely (Ed.), *Educational Media and Technology Yearbook* (pp.5-18). Englewood, Colo: Libraries Unlimited.

Evans, T.D. (1996) Encouragement: The key to Reforming Classrooms. *Educational Leadership*, 54(1), 81 - 85.

Faison, C.L. (1996). Modeling Instructional Technology use in Teacher Preparation: Why we can't wait. *Educational Technology*, 36(5), 57-59.

Fisher, J.L. (1994). "Reflections on Transformational Leadership." *Educational Record*, 75(3),54-60

Franklin, U. (1990). *The Real world of Technology*. Toronto: CBC Publications

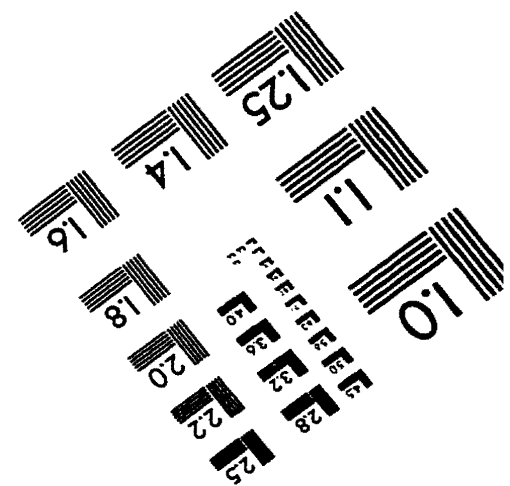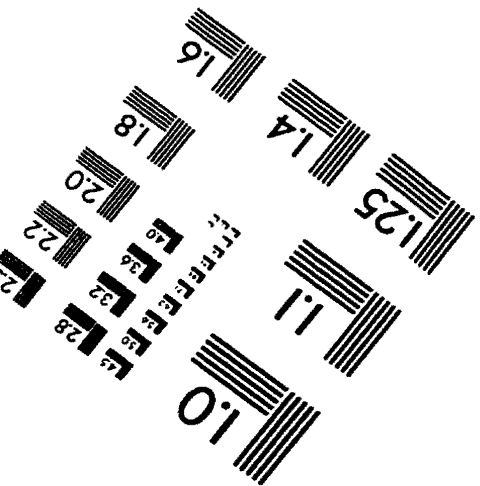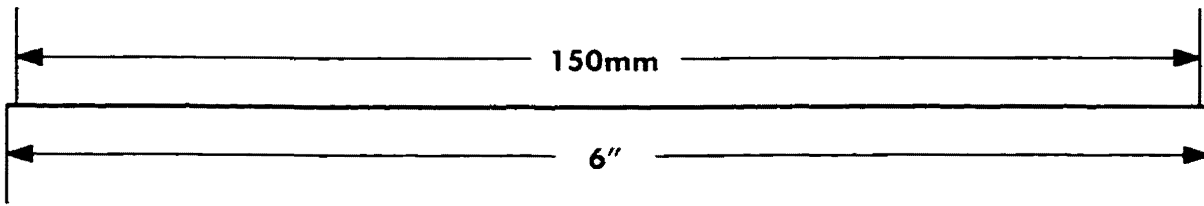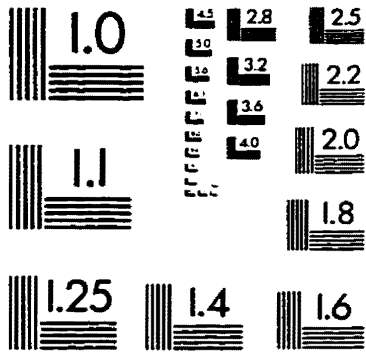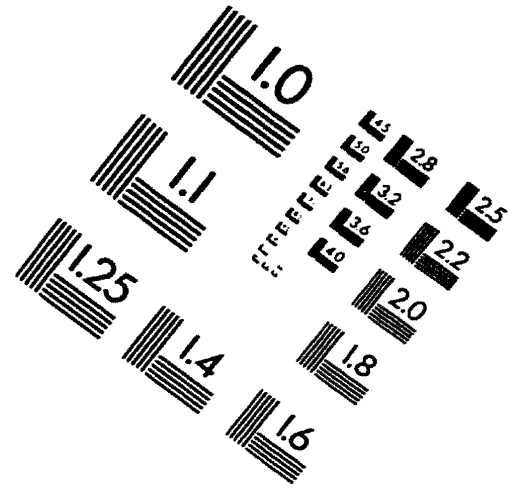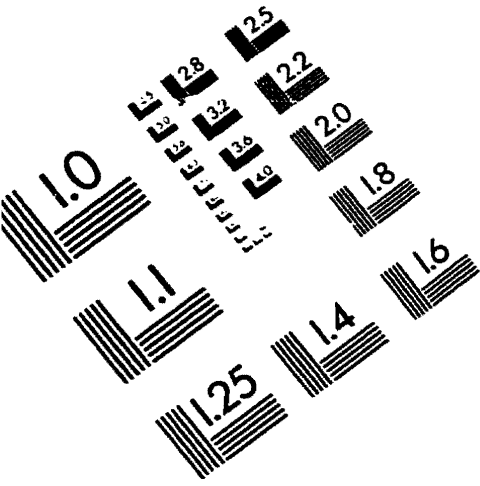Fullan, M.G. (1990). Staff development, innovation, and institutional development. In B.

Joyce (Ed.), *Changing school culture through staff development, the 1990 ASCD Yearbook.* (pp. 3-25). Alexandra, VA: Association for Supervision and Curriculum Development.

Fullan, M.G. (1993). *Change Forces: Probing the depths of educational reform.* London: Falmer Press.

Fullan, M.G. (1995). The school as a learning Organization: Distant Dreams. *Theory into Practice,* 34(4), 230-235.

Gearhart, S. (1983). An end to technology in J. Rothschild (Ed.), *Machina Ex Dea: Feminist Perspectives on Technology* (pp. 179-181). New York: Pergamon Press.

Goldberg, B. & Richards, J. (1995). Leveraging Technology for Reform: Changing Schools and Communities in to Learning Organizations. *Educational Technology,* 35(5), 5-16.

Greening, T. (1998). Building the Constructivist Toolbox: An exploration of Cognitive Technologies. *Educational Technology,* 38(2), 23-35.

Greeno, J. (1991). Productive Learning Environments in S. Lewis & S Otsuki (Eds.) *Advanced Research on Computers in Education* (pp. 3-13). Amsterdam: Elsevier.

Hancock, V. (1997). Creating the Information Age School. *Educational Leadership,* 55(3), 60-63.

Hargrove, R. (1995). *Masterful Coaching.* San Diego: Pfeiffer & Co.

Hallinger, P. (1992) "The evolving role of American principals: From Managerial to instructional, to transformational leaders." *Journal of Educational Administration,* 30(3), 35 - 48.

Johnson, D.L. (1997). Integrating Technology in the Classroom: The Time has come. *Computers in the Schools,* 13(1/2), 1 - 5.

Jones, B.F. (1992). Cognitive designs in education in M. Alkin (Ed.), *Encyclopedia of Educational Research* (6th ed). (pp.166-178). New York: Macmillan.

Kearsley, G. (1998). Educational Technology: A Critique. *Educational Technology,* 38(2), 47-51.

Kearsley, G. & Lynch, W. (1996). *Educational Technology: Leadership perspectives.* Englewood Cliffs, NJ: Educational Technology Publications.

Leithwood, K.A. (1994). "Leadership for School Restructuring". *Educational Administration Quarterly,* 30, 498 - 518.

Lockard, J., Abrams, P. D., & Mary, W.A. (1990). *Microcomputers for Educators* (2nd Ed.) Northern Illinois Univ.: Harper Collins.

Loveless, A.M., (1997). The Visual Arts and Information technology in the classroom. *Computers in The Schools*, 13 (½), 99-108.

Maddux, C.D. (1987). Educational Computing: A Sunday Morning Assessment. *Computers in The Schools*, 4(2), 53-56.

Maddox, C.D. (1988). *Logo: Methods and Curriculation for Teachers*. New York: Haworth.

Manges, C.D. & Wilcox, D.J. (1997). The Role of the Principal in Rural School Reform. *Rural Educator*, 18(3), 21-23.

Marcus, M.L., & Bjorn-Andersen, N. (1987). Power over Users: Its Exercise by System Professionals. Communications of The ACM, 30, 498-505.

Marcinkiewicz, H.R. (1991). Levels of use of the innovation: A framework for analyzing innovation adoption. *The Journal of Teacher Education*, 26 (2), 52 - 56.

Martin, M. & Taylor, S.A. (1997). The Virtual Classroom: The Next Steps. *Educational Technology*, 37(5), 51 - 55.

Means, B., Blando, j., Olson, K., Middleton, T., Morocco, C.C., Ramz, A.R., & Zarfass, J. (1993). *Using Technology to Support Education Reform* Washington, D.C.: U.S. Government Printing Office.

Means, B., Olsen, K., & Singh, R. (1995). Transforming with Technology: No "silver bullet." *Phi Delta Kappan*, 77, 69-72.

Mergendoller, J.R. (1997) Sifting the Hype: What Research Says about Technology and Learning. *Principal, 76*(3), 12-14.

O'Brien, T.C. (1994). Computers in Education: A Piagetian Perspective in J.J. Hirschbuhl (Ed.), *Computers in Education* (6th ed,.) (pp.9-12) Guilford, CT: Dushkin.

Okolo, C.M., Bahr, C.M.,& Reith, H.J.(1993). A Retrospective View of Computer-based Instruction. *Journal of Special Educational Technology*, 12(1), 1-27.

O'Neil, J. (1995). Technology and Schools: A Conversation with Chris Dede. *Educational Leadership*, 53(2), 6 - 12.

Pucel, D.J. (1995). Developing Technological Literacy: A Goal For Technology Education. *The Technology Teacher*, 35-43.

Rieber, L. & Welliver, P. (1989) Infusing educational technology into mainstream educational computing . *International Journal of Instructional Media*, 16(1), 21 - 31.

Riffel, J.A. & Levin, B. (1997). Schools coping with the impact of Information Technology. *Educational Management of Administration*, 25 (1), 51-64.

Rifkin, J. (1995). *The End of Work*. New York: G.P. Putnam's Sons.

Ritchie, D., & Wiburg, K. (1994). Educational variables influencing technology integration. *Journal of Technology and Teacher Education*, 2(22), 143 - 153.

Salpeter, J. (1998). Taking Stock: What's the Research Saying. *Technology and Learning*, 18(9), 24 - 40.

Salzano, J. (1992). *The key to successful computerization is through good trainers*. Paper presented at the International Conference on Technology and Education. Paris, France.

Sardello, R.J. (1991). The technological threat to education in J. Zerman & A. Carnes (Eds.) *Questioning Technology: Tool, Toy or Tyrant*. (pp. 142-152) Philadelphia, PA: New Society Publishers.

Schlechter, T.M. (1991). Promises, Promises, Promises: History and Foundations of Computer-Based Training in T.M. Schlechter (Ed.). *Problems And Promises of Computer Base Training* (pp. 1 - 20). Norwood, N.J.: Ablex Publishing Corporation.

Schofield, J.W. (1995). *Computers and Classroom Culture*, New York, NY: Cambridge University Press.

Senge, P.J. (1990). *The Fifth Discipline: The Art and Practice at the Learning Organization*. Toronto: Doubleday.

Sergiovanni, T.J. (1990). *The Principalship: A Reflective Practice Perspective* Toronto: Allyn and Bacon.

Sergiovanni, T.J. (1996). *Leadership for The Schoolhouse: How is it Different. Why it is Important?* San Francisco: Jossey-Bass.

Sheppard, B. & Brown, J. (1998). *Teacher Leadership and change at the School Level*. Paper presented at the Annual Conference of the Canadian Society for the Study of Education, University of Ottawa. Ottawa: Canada May 1998.

Steinberg, E. (1987). The Nature of the Educational Technology in R.M. Thomas & V.N.Kobay ashi (Eds.) Education Technology-Its creation, development and cross-cultural transfer

(pp. 1-23). Toronto: Pergaman Press.

Sterns, M.S. (1991). Teacher centered model of technology integration: End of year 3, *Cupertino-Framont Model Technology Schools Project Research Finding*. Cupertino, CA.

Stevens, K. (1994). Australian Developments in Distance Education and their Implications for Rural Schools. *Journal of Research in Rural Education*, 10(1), 78-83.

Stoddart, T. & Niederhauser, D. (1993). Technology and Educational Change. *Computers in the Schools*, 9(2/3), 5 - 21.

Tapscott, D. & Caston, A. (1993). *Paradigm Shift: The New Promise of Information Technology*. Montreal: McGraw-Hill, Inc.

Tichy, N. M. & Devanna, M.A. (1986). *The Transformational Leader*. New York: John Wiley.

Tucker, S.A. (1995). The Promise of Electronic Learning. *Educational Leadership*, 49(6), 19-22.

Van Dusen, L.M. & Worthman, B.R. (1995). Can Integrated Instructional Technology Transform the Classroom? *Educational Leadership*, 53(2), 28 - 43.

Wiburg, K.M. (1997). The Dance of Change: Integrating Technology in Classrooms. *Computers in the Schools*, 13 (1/2), 171 - 184.

Willis, J. (1993). What Conditions Encourage Technology Use? It Depends on the Context. *Computers in the Schools*, 9(4), 13 - 32.

Worzel, R. (1994). *Facing the Future: The Seven Forces Revolutionizing our Lives*. Toronto: Stoddart Publishing Co. Limited.

Yukl, G. (1994). *Leadership in Organizations*, (3rd ed.). Englewood Cliffs: Prentice-Hall

IMAGE EVALUATION
TEST TARGET (QA-3)

APPLIED **IMAGE** . Inc
1653 East Main Street
Rochester, NY 14609 USA
Phone: 716/482-0300
Fax: 716/288-5989