KnowledgeWorks
F o u n d a t i o n

Learning to Adapt
Imagining the Future of Learners, Learning Experiences, and Learning Communities in a 21st Century Knowledge Society

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Learning to Adapt

Imagining the Future of Learners, Learning Experiences, and Learning Communities in a 21st Century Knowledge Society

Executive Summary

What experiences are essential so that all students accomplish the curriculum necessary to become good citizens, positive family members, and productive workers?

This paper responds by presenting a description of the learners, learning experiences, and learning communities of 2020–when the babies of today will be in high school. It is a description based on lessons learned, on promising new educational ideas beginning to take hold around the nation, on opportunities inherent in the expansion of the knowledge society—and on hope.

Young people entering South Carolina's workforce in the 2020s will find an economy driven by knowledge and ideas. The pathway to earning a living wage will be the ability to function in complex situations—beyond the routine problem-solving and communications tasks that are increasingly being transferred to smart computer systems and low-paid workers overseas. Skilled workers in the manufacturing and service jobs of the 2020s will be skilled thinkers who work in dynamic teams, continually seeking better, faster, more cost-effective, more customer-conscious, and more creative ways to deliver products and services to the marketplace.

The intellectual abilities of these workers, along with the scientific, technical, creative, and entrepreneurial minds of others, will be the key to South Carolina's continued economic competitiveness in the 21st century.

The young people of the 2020s will assume the responsibilities of citizenship in a world that is both globally connected and sharply divided. For themselves and for the generation that follows, they will need to preserve and illuminate our democratic way of life while maintaining productive relationships in an increasingly interdependent world. In their workplaces, communities, and neighborhoods they will be required to understand and cooperate with people of diverse cultures and perspectives. In fulfilling their civic duties, they will face ethical and social dilemmas that require not only sound reason but also keen insight, empathy, and wisdom.

The intellectual capacity needed for the challenges of work, citizenship, and family life in the 2020s will come from knowledge that dynamically branches within and connects across disciplines. Even more, it will come from continuously adapting—learning, relearning, and unlearning in all types of settings, applying knowledge in new ways, building relationships and networks, thinking creatively, and using technology innovatively.

To provide the learning experiences that develop this intellectual capacity, educators, schools, and education systems also must learn to adapt—to the continuous expansion of knowledge, to the diversity of student needs, to the rapid advancement of technology, and to the infusion of ideas and innovations that constitute the challenge and the opportunity of a knowledge society.

One way to begin the process of learning to adapt is to examine the important components of education in the context of a 21st century knowledge society.

Three over-arching recommendations for change are presented in this paper.

School As a Learning-Centered Community. School must become a place where students feel surrounded by people who care—their parents, teachers, classmates, and community members. It must be a community of learners that draws upon the strengths of its larger community. And it must be a place of support and strength for children, youth, and families facing barriers to learning.

Learning As a Pursuit of Capability. Learning must be built on core knowledge but learning experiences also must reflect the world in which students live and the entire spectrum of cognitive and creative processes that will be needed in the knowledge economy and society. They must be rich and engaging, requiring students to inquire, investigate, and create. The results and the assessment that examines those results must reflect what the student has learned, how the student has learned, and why the student has learned.

Educators as Learning Leaders in Adaptive Organizations. Educators must adopt new roles as they help students gain the knowledge they will need, as they work with colleagues, and as they interact with other knowledge professionals. Education systems and schools must become environments that allow creative ideas to be explored, that play a leadership role in technology development, and that support positive choices for parents, students, and educators.

These three broad recommended changes form the organizational structure of this paper. Following each section is a list of more specific recommendations for systemic change and support.

Finally, throughout this paper are fictional scenarios that create a picture of what schools in 2020 might "look like" if the ideas presented are adopted.

Table of Contents

Learning to Adapt

Imagining the Future of Learners, Learning Experiences, and Learning Communities in a 21st Century Knowledge Society

Attending "dreaming sessions" with customers and working on "imagination breakthrough projects"—those strange-sounding activities are part of life at one global company that employs 310,000 workers. Working there, says the corporate website, offers a culture that is "open" and "energizing" and "a sense of possibility that allows for a freedom beyond mere invention." It's a "quest" that requires "passionate" people who are "curious" and "resourceful."

The company is not Disney, nor is it Microsoft. It is not located in a skyscraper on Madison Avenue. It does not produce designer clothes or video games. It's General Electric—one of the grandfathers of corporate America and a creator of manufacturing jobs in South Carolina and other parts of the world.

And GE is not the only "imagination" company. Recently, Robert Lutz, General Motors Vice Chairman of Product Development, made this statement: "I see us being in the art business. Art, entertainment, and mobile sculpture, which, coincidentally, happens to provide transportation" (Hakim, 2001).

These references to innovation and creativity are not advertising hyperbole. They are references to a key competitive strategy among U.S. industries—a strategy that reflects a new phase in the evolution of what we have come to call the "knowledge age."

This new phase in one of history's greatest economic transformations has a deep significance and far-reaching implications for South Carolina's workforce, its communities, and its schools. Approaching this new phase today in a visionary and pioneering manner will make South Carolina a leader in the education arena of the 2020s—and possibly a place where growth industries will flourish and where highly skilled people will choose to work and live.

The Knowledge Age: Looking Back and Looking Ahead

We live in an historic time. The Industrial Age, characterized by the mass production of goods through mechanization, is fading away, and the Knowledge Age is on the rise.

In its earliest phases, this new era was called the "Information Age" because of the economic benefits of large, expensive, centralized computer systems that accelerated decision-making, accounting, inventory, and other business functions. As personal computers began to be widely marketed in the 1980s and the Web began to connect the world during the 1990s, many began to use the term "Digital Age," a name that reflected the new speeds at which commerce could be conducted and information could be exchanged.

From Information to Knowledge to Ideas

In the midst of our amazement at the speed and power of information technology, a new realization emerged: It is not the computer but rather the knowledge of those who use it—the "intellectual capital"—that defines the new economy. Those who possessed this new means of economic competitiveness soon became known widely as "knowledge workers."

It also became apparent that the knowledge driving the new economy and shaping the future was global in its origins and in its reach.

Knowledge Work

Most knowledge workers possess a range of interdependent knowledge and skills that could be said to fall into the major categories of technical, communicative, and creative. Most knowledge workers must possess a good measure of each.

Scientific and technical knowledge is the principal intellectual capital some workers bring to the knowledge society—from the researchers who use the laws of mathematics, physics, and other sciences to create a range of technologies to the software professionals who bring the complex processes of science, engineering, and business onto people's desktops and into cyberspace.

Some combine specialized knowledge with communication and interpersonal skills to help people solve problems, particularly in complex situations where customers and clients need access to specialized knowledge and skills. Some knowledge workers do this through services–providing legal counsel or analyzing an investment portfolio, for example. Others, such as journalists and analysts, produce by thinking in complex ways and communicating knowledge through language, symbols, sounds, and images.

Finally, some knowledge workers use primarily intuitive knowledge and creative skills to see possibilities, generate ideas, and find ways to express those ideas in beneficial ways—from artists and interior designers who enrich quality of life, to marketing professionals who convey information persuasively and memorably, to the leader who creates innovative social programs that help and lift up people in need.

Whatever the concentration and mix of technical, interpersonal, and creative skills a job requires—and the combinations seem endless—the work that fuels the knowledge economy requires the ability to:

- Work collaboratively with people from a variety of disciplines and backgrounds, including people from other countries

- Work with a high degree of autonomy and minimal supervision, as well as an entrepreneurial spirit

- Move flexibly from one challenge to another, adapting to new technologies and dynamic environments, learning rapidly, and using knowledge in both conventional and novel ways.

Impacts on Employment

Jobs that require high skills and complex thinking initially were associated with college-educated knowledge workers earning high wages. During the 1980s and 1990s, the term "knowledge worker" typically referred to systems analysts, programmers, and managers with MBA degrees or at least baccalaureate level education in business. But the demand for knowledge was already expanding at that time.

In 1996, Richard Murnane from Harvard and Frank Levy from Massachusetts Institute of Technology interviewed managers at Honda, DiamondStar Motors, and Northwestern Mutual Insurance Company. Based on their research, they proposed a set of "new basic skills" needed to earn a middle class income in a changing economy—at least high school level abilities in mathematics, reading, and problem-solving; the ability to use personal computers "to carry out simple tasks like word processing;" and the ability to work in teams and present information in written and oral form.

Not even ten years later, Levy and Murnane have raised the bar. Their book *The New Division of Labor* (2004) projects a "continued decline in moderately skilled and less skilled labor" jobs. The reason for this decline, they say, is that computers increasingly are replacing human labor in jobs that can be performed by following a set of rules. Job growth, say the authors, is occurring among "occupations in which computers complement expert thinking and complex communication to produce new products and services." In other words, many of those who mastered the "new basics" of 1996 no longer have a reasonable degree of job stability.

A New Phase

Many of today's higher skilled "knowledge sector" jobs are in what John Howkins (2001) calls the "Creative Economy," a sector composed of fifteen industries that produce intellectual property and are responsible for much of the U.S. economic advantage. Jobs in these and other industries are performed by what Richard Florida (2002) calls the "creative class." This group, which now represents 30% of the U.S. workforce and earns the highest average annual salary in the nation, includes a "Super-Creative Core" of about 15 million workers whose jobs involve producing "new forms or designs that are readily transferable and widely useful." Also included are "creative professionals," a larger group whose members "engage in creative problem-solving, drawing on complex bodies of knowledge to solve specific problems." Many jobs now considered part of the service sector, says Florida, also are beginning to incorporate some elements of the creative process.

The growing preeminence of creative industries and jobs are part of a shift that writer Daniel Pink (2005) describes as "moving from an economy and a society built on the logical, linear, computerlike capabilities of the Information Age to an economy and a society built on the inventive, empathic, big-picture capabilities of what's rising in its place, the Conceptual Age."

The Long-Term Picture

Based on the vitality of the creative economy, it also is likely that new jobs will be created as new ideas for products and services emerge. By the 2020s, it is likely that more jobs and industries will require such capabilities. In a global economy that replaces workers in routine, noncognitive jobs with computers or uses overseas labor to perform them more cheaply, young workers who want to succeed economically will either need to train for higher skilled jobs or find ways to redefine service jobs by adding a creative or personal touch.

3

Finally, graduates in the 2020s will be entering a highly volatile job market. The 2020s will find us at the height of the coming Molecular Age, a time in which advances in the fields of biotechnology, material science, and nanotechnology will drive the economy and create jobs. On the other hand, computer technology will continue to destroy jobs as more work tasks are transferred to smarter computers. Advances in artificial intelligence and the advent of "ubiquitous computing" in which entire environments are infused with intelligence through the intercommunication of myriad inexpensive microprocessors (Mulhall, 2002) will replace humans in performing even some non-routine, cognitive work tasks, and yet the continued increases in speed as electronics moves to the subatomic level and the greater connectivity that results from increasingly cheaper computers are likely to bring new business opportunities and jobs. The course of change may not be predictable, but the need for companies and their workers to adapt to change is a certainty.

The Challenge for South Carolina

As South Carolina envisions the next stage in the development of its education system, three "transformations" in the learning experience should be considered:

- School As a Learning-Centered Community
- Learning As a Pursuit of Capability
- Teachers As Creative, Collaborative Learning Leaders in Adaptive Systems

The KnowledgeWorks Foundation has seen glimpses of what schools that are striving for these three transformations can do in the lives of students. We believe that if South Carolina's education system were to commit to achieving these transformations—from individual educators and schools to the state system—achievement would begin to improve dramatically. More importantly, however, learning would become the vibrant, meaningful, world-changing experience it is meant to be.

A suggested approach as South Carolina takes up the task of rethinking its education system is to suspend underlying assumptions and biases about the roles, cycles, rhythms, and routines of schools. Also necessary to set aside, at least temporarily, are the pragmatic concerns that limit creativity—concerns about scarce education funding, about issues that divide us today, and about risk factors that often limit today's children.

Many of the ideas found in this paper are not new. They already are being implemented on a small scale and may be found in South Carolina classrooms. Perhaps this paper will help heighten the attention on those ideas so that they will be more closely examined and more effectively evaluated. Some ideas are likely to be seen as too risky, too impractical, or too unconventional—just as many of the ideas that surface in the "dreaming sessions" held at General Electric and other companies fall by the wayside. Perhaps those ideas will inspire better alternatives or simply provide a different view of current reality.

And some ideas, it is hoped, will resonate. Perhaps they will lead to further exploration and innovation by the creative minds that hold the greatest promise for the future of education in South Carolina.

School As a Learning-Centered Community

The 21st century knowledge economy is sustained and energized by interdependent, ever-changing webs of relationships. Manufacturers, their suppliers, and retailers create economic webs to meet customer demands and improve the cost-effectiveness and responsiveness of their "value chain." Industry clusters stimulate regional economies. Research consortia of businesses, higher education institutions, and government labs

collaborate to achieve and commercialize technology breakthroughs. Small businesses and independent knowledge entrepreneurs pool their talents to tackle complex projects.

Ideally, schools will have a similar web of relationships to support student success. Needed at the center of this web are caring, trusting relationships between a team of teachers and a group of students—each bond unique yet each built on a foundation of high expectations and acceptance. The web of relationships that begins in the school building also must reach into the circle of each student's family, weave together the diverse threads of neighborhood and community, and connect students' minds to the patterns and puzzles of our world.

It is educators who must begin the web by connecting to their students and reaching out to families and the community. But they cannot do it alone. Families, employers (of all sizes), civic and community organizations, the faith communities, social service agencies, Technical Colleges and other higher learning institutions, the arts and cultural groups, retirees, the medical community and government offices in the community all must commit with an equal level of dedication—doing what each does best so that every child receives the opportunity to learn.

Perhaps schools, families, and communities will accomplish together that which schools cannot achieve alone.

Imagine . . . A weekday morning in the year 2020.
Read these imaginary scenarios throughout the paper to spark your own vision of the possibilities.

Citizens throughout the state of South Carolina are preparing for a day of learning. In growing suburbs, historic villages, and small resort towns, learners of all ages have awakened with a sense that this day will bring new discoveries, exciting opportunities, engaging challenges, and interesting exchanges across a network of relationships. Evidence of people's learning, innovation, and collaboration is everywhere. Public buildings and city streets, offices and manufacturing facilities, farms and parks, homes, neighborhoods, and city streets—all invite learning and display its benefits. But in just about every community, there is one place where learning abounds—a place that invites and embraces the knowledge of scholars and citizens, the breakthroughs of science, the know-how of the marketplace, the beauty of the arts, the perspectives of other cultures, the wisdom of the aged, and the curiosity of the young. That place is what everyone used to call "the high school."

People still haven't figured out what to call these places where adolescents and young adults do much of their learning. Officially, they are called "community learning centers," but journalists chronicling South Carolina's growing reputation as a center for new high tech industries have called them idea incubators, inspiration centers, and connecting points in the global knowledge network.

Personalizing the School Experience

What if every student were recognized, understood and his/her successes and hard work celebrated? What if every student had quality teachers, mentors in the community and a community of peers who supported learning and responsibility? What if the exploration and learning of school were intertwined with the hopes and aspirations of each child's family? And what if the local school were a community-learning center, where parents could take courses, attend seminars, or upgrade their training with minimum timer away from their families?

To be successful, young workers in 2020 will need to navigate networks of relationships—working collaboratively with co-workers, listening to customers, and engaging people who possess expertise or knowledge they need. Furthermore, they will need to understand and communicate with an increasingly diverse array of people in their communities. Therefore, the school environment must be a place where students experience the rewards and challenges of relationships and of working actively with peers and adults toward mutual goals.

IMAGINE

Each student always knows that at least one teacher has invested knowledge, creativity, and energy in searching for better ways to understand, reach, motivate, and educate him or her. Each student can go to a caring adult when concerns arise. Conflicts are not ignored. Hurt is not overlooked. Accomplishments are witnessed.

Positive, caring relationships in school, as well as in the home and community, not only teach students the interpersonal skills needed in the future but also significantly enhance literacy development. According to the National Center for Clinical Infant Programs (McLane and McNamee, 1991), early literacy develops as "part of a social process, embedded in children's relationships with parents, siblings, grandparents, friends, caretakers and teachers."

Furthermore, students' intellectual engagement and motivation—so essential to learning—are strongly related to school climate. Studies in neuroscience and cognition have established that emotions and relationships strongly influence intellectual functioning (Sylwester, 1995; LeDoux, 1996; Pert, 1997; Siegel, 1999). Therefore, reducing fear and anger, treating students as intelligent individuals, and helping each of them build rich connections and bonds with their teachers and classmates will be central strategies in effective 21st century schools.

Strengthening Positive Relationships

We must always remember that parents are their children's first and most important teachers and schools need to be much more welcoming of parents and involve them in new and positive ways. Personalized 21st century schools provide time in the school day for individual students or small groups to receive help with academic or other issues (Makkonen, 2004). Advisory periods during the school day take a variety of forms, from informal conversations about controversial issues to teacher and peer tutoring sessions to a team effort by teachers and guidance counselors to provide intensive intervention for troubled students. After school mentoring programs also will make responsible, caring adult role models available to students. These programs will help build the "relations of mutual recognition and regard" that Donna H. Kerr (1997) says are fundamental to democracy.

Using Multi-Year Strategies to Strengthen Bonds

In effective 21st century elementary and middle schools, teachers and students will have more long-term relationships. Many schools will use looping—advancing a teacher from one grade level to the next along with his or her class. Grade level teams—placing a group of students with an interdisciplinary team of teachers—also will be common. Studies of schools using both approaches suggest that educators developed deeper relationships with both students and their parents (Burke, 1997; Mertens & Flowers, 2004).

Making High School Communities Smaller

Increasingly, 21st century high schools will restructure to create smaller learning communities. The configurations will differ: Some will be single independent schools in a single building, and others will be small autonomous schools within large facilities. What all will have in common are teachers who are knowledgeable about each student's learning

POTENTIAL MODEL

Through the Ohio High School Transformation Initiative (OSHTI), eighteen large, low-performing urban campuses are being transformed into 69 new small high schools, where students receive personalized attention and study rigorous and relevant academic content.

Funded by the Bill & Melinda Gates Foundation, the KnowledgeWorks Foundation, the Ohio and U.S. Departments of Education, the Ford Foundation, and some of Ohio's small community foundations, the new small schools tailor learning to fit student needs and individual learning styles, make learning relevant to students through "majors," such as business or health, and replace the traditional "stand and deliver" lecturing style of the past with team-based projects and other real world work experiences.

strengths and needs, thoughtful about differentiating learning experiences and environments for the benefit of all students, and most of all, consistent in being positive presences in each student's life.

Research shows that students in small learning communities feel less alienated and tend to be more actively engaged in school activities (Fine & Somerville, 1998). A growing body of research has linked smaller high schools to improved student performance, reduced violence, and higher graduation and college enrollment rates. (KnowledgeWorks Foundation, 2005; Cotton, 1996). In addition, effects of school size are greatest for low-income and minority students (Wasley et al, 2000).

Providing Student Leadership Opportunities

Remarking on his interviews with a number of young people, William Damon (1997) notes that he saw "virtually no expression of social concern, political opinion, civic duty, patriotic emotion, or sense of citizenship in any form" in their responses. Interviews with high school students by the KnowledgeWorks Foundation revealed that many high school students believe teachers do not hear their ideas and concerns or give them a voice in decision-making.

Those two findings may well be related. Perhaps young people do not participate in our democracy because they did not experience its power in school. The best way to *teach* democratic values is to *be* a democratic institution, one in which students have "access to social understanding, developed by personal participation in a democratic community and direct experience of multiple perspectives" (Darling-Hammond, 1997).

Example—

Sistas & Brothas United (SBU) is a community program in the Bronx, New York, which prepares students for leadership, SBU trains students to develop and implement an action plan that addresses a current problem in their community.

Creating Strong Family-Educator Relationships

In effective 21st century schools, ongoing relationships between parents and teachers foster the fuller understanding of a child that Sara Lawrence-Lightfoot stressed in her study of parent-teacher conversations (2003). Together effective 21st century educators will join with parents in confronting and counteracting "the unacknowledged curriculum" derived from "a virtually lifelong immersion in television, recorded music, radio, billboards, video games, and . . . other media (Gitlin, 2003)—a curriculum that is at odds with both the intellectual skills teachers try to develop and the values parents strive to share. Together, they will model the understanding and respect for differences in perspectives shaped by different ethnicities—two contrasting voices, dialects, or languages communicating the same concern and hope for the student's future. Together, they will open the door to a world outside the classroom–the world of the parent's workplace, history, and culture. Together they will send the

message that Laurence Steinberg (1996) says must be communicated to high school students: *School is more important than recreational activities and after-school employment.*

Finding ways to much better connect schools and families—parents and teachers—is no longer a mystery. There is a growing body of research summarized by the Southwest Educational Development Laboratory (SEDL), which should and must be used to better link these powerful allies for student learning. Most teachers and principals are unaware of this research and have had little time to use it and refine it, but they must in these changing times.

Learning in 2020—The day begins . . .

The mechanical rituals of what was once called "home room period" have been replaced by a time when "learning leaders" formerly known as teachers welcome young learners and give them an opportunity to reconnect with people who know them well.

A Place of Stability. *Although teams at the community learning center tend to be fluid, every student has a central cluster of peers and adults that remains connected for four years. Each central cluster—none larger than 25 students—has its own common room where students, teachers, and parents can connect.*

A Place of Connection. *A space the size of today's classrooms, each common room contains an open office space with desks for the learning leaders and a large table that accommodates the entire team. Five students a day must stop in at an appointed time to brief one of the five learning leaders on the work they are doing and their progress. Learning leaders regularly access each learner's electronic portfolio and individual learning plan, which are linked to a database of met and unmet performance goals in key areas.*

A Place of Comfort and Community. *Opposite the office space are some comfortable chairs, a couch, and some large cushions. Student art work and photography are on the walls, and their books and magazines, music discs, and writings lie on a low table, ready to be shared with all. Windows look out over a garden that everyone in the cluster, including their parents, helped create.*

Drawing Community Life into Schools

What if every school manifested not a community's problems but all of its strengths, beauty, and knowledge?

Despite the possibilities for commerce and connection in today's electronically wired world, being able to function within a community will be an essential skill in the 2020s. Successful internet businesses today, says Harvard Business School's Rosabeth Moss Kanter (2002), operate like communities. Workers express their individuality and have a sense of identity and culture. They act and are treated like volunteers rather than like employees. Their informal social networks play a role in their career advancement not only because of the job opportunities afforded the individual but also because those networks benefit organizations (Cross, Parker, & Sasson, 2003).

Similar communities and social networks with similar benefits will develop around 21st century school facilities that are designed as centers of community. They will be places that offer new opportunities for students and adult citizens to learn, network, share their knowledge, and participate in community development. With help from community-based organizations, these schools will be kept open outside the regular school hours to provide

IMAGINE

School facilities and grounds once locked by 3:30 p.m. become the modern-day equivalent of the village green of learning. Students can catch and keep up with their studies, they can take additional subjects and learn another language not available in the normal school day; they can explore careers and college and they can form student groups to learn anything from chess to starting a business or staying fit. Civic life blossoms in the midst of numerous after school options for students. Citizens of all ages can also take courses in the late afternoon and evening and pursue their interests. Community improvement projects and service learning projects of all kinds are conceived, developed and launched.

tutoring and enrichment activities for students, as well as care and supervision for students whose parents are at work. They also will be the site for programs that benefit students' families and other community members. Parents entering their children's school building on a typical evening in 2020 may be there for:

• Formal adult literacy, computer training, and college courses

• Informal inquiry groups that pursue questions and topics of interest

• Job fairs and demonstrations by skilled trades- and craftspeople, as well as presentations by community agencies or lectures by university faculty on topics of interest

• Cultural and creative activities

• Family literacy activities and other learning experiences that parents and children can pursue together, as well as opportunities for students to work with mentors

• Counseling and support groups

• Community forums and assistance with citizen initiatives.

Example—

Research confirms that family literacy programs offer an effective long-term approach to breaking the interrelated cycles of poverty and low literacy skills (National Center for Family Literacy, 1997).

Comprehensive family literacy programs include:

1) Age-appropriate education to prepare children for success in school and life experiences (early childhood education).

2) Parent literacy training that leads to greater economic self-sufficiency (adult education).

3) Training for parents in how to be the primary teacher for their children and full partners in the education of their children

4) Interactive literacy activities between parents and their children.

See http://www.famlit.org for information about corporate support for family literacy programs.

Building Social Capital

Our present era, says Paul Hopper (2003), is the "age of individualism." Many have noted a decline in trust, public-spiritedness, and community life, increasing income inequality and class distinctions (U.S. Census Bureau), and a marked decrease in the American tradition of joining voluntary associations (Putnam, 2000). The resulting erosion in social capital can be devastating for disadvantaged populations, who are not exposed adequately to the

mainstream social networks that can "facilitate social and economic advancement" (Wilson, 1996).

By drawing community life into schools, 21st century learning communities will provide an opportunity to rebuild the social networks that communities have lost. Because people from different races, classes, and professions will be part of these learning communities, the resulting social networks will be what Robert Putnam calls "bridging" networks, "the kind of social capital most essential for healthy public life" (2003). Francis Fukuyama credits such networks with the creation of the "spontaneous sociability" found in the most innovative organizations (1995). In other words, vibrant community learning centers in school buildings will radically change the course of community quality, growth, and development.

Creating More International Connections

As suggested by the presence of BMW, Honda, and other multinational corporations in South Carolina, the state is a prime location for global companies from Europe and Asia to build U.S. plants.

Along with the state's other strategies for attracting new enterprises, such as research consortia and excellent workforce training programs, schools that are centers of community will sharpen the state's competitive edge. In vibrant schools as centers of community, those who consider South Carolina as a possible location also will see the interdependence and "embeddedness" that Europeans value (Rifkin, 2004).

Becoming a Gathering Place to Strengthen Community

As the most "child-friendly," public spaces available in most communities, effective 21st century schools will lead or join an emerging shift toward more vibrant community life. In the past decade, communities have begun to plan for greater connectedness through a reenergizing of public spaces. Coffee shops and bookstores are abuzz with conversation both face to face and via cell phone and wireless internet. Library computers are continually in use. Small towns are organizing art walks and free concerts on the town square while large cities are developing sidewalk seating areas, outdoor markets and pedestrian zones. According to the Project for Public Spaces (www.pps.org), "thriving public spaces give residents a strong sense of community and promote the kinds of familiarity and social bonds that make neighborhoods safer and healthier."

Evidence of the importance of public spaces in South Carolina is the reemergence of two small town opera houses in Newberry and Abbeville, South Carolina.

Expanding Linkages and Partnerships with the Whole Community

Schools that are central to community life also will be connected to a new cadre of human resources that is transforming society.

We have entered "the century of the social sector organization," says management expert Peter Drucker—a time in which nonprofits will "largely determine the values, the vision, the cohesion, and the performance of the 21st century society" (www.drucker.org). In addition to improving human health and well-being, says Drucker, the social sector fulfills another important purpose in our large, complex society—creating citizenship by allowing individual volunteers to make a difference (Drucker, 1994).

The social sector, however, is not the only source of civic responsibility. Many of today's knowledge workers, likely to be the leaders of the 2020s, are much more involved in community service and civic action. Richard Florida (2002), in his interviews with workers in the creative industries, found that they "seek latitude to use work time and resources for community projects" and see community involvement as "part of their creative identity."

Many knowledge companies are creating a supportive environment for their employees' volunteer activities and are even developing company-wide service projects. Moreover, some young people have chosen to pursue careers as social entrepreneurs, defined by David Bornstein as "people with new ideas to address major problems who are relentless in pursuit of their visions." These "social innovators," says Bornstein, use the same skills that bring new products to market (2004).

Effective 21st century schools will seek innovative ways to collaborate with nonprofit organizations and to work with citizen organizations and volunteers from the knowledge industries. Thus they will tap into vast sources of intellectual, social, and cultural resources, and they will create a new generation of education advocates who understand the challenges of preparing students for the 2020s.

PRINCIPLES TO GUIDE SCHOOL FACILITY DESIGN

The KnowledgeWorks Foundation (www.kwfdn.org) offers these guidelines for designing small school facilities.

- School facilities planning should begin as early as possible - ideally, at least two years in advance of decision deadlines.

- A school's educational program should drive facility design.

- A wide variety of stakeholders - including school staff, parents, students, and community members - should be engaged in the planning and design of school facilities.

- Facilities decisions should be informed by current research on topics such as the impact of facilities on learning and the design of effective learning environments.

- Schools should be centers of community that benefit students, families, and neighborhoods by providing an array of supports and opportunities.

- School buildings should be open to students, families, and the community before, during, and after school, including evenings, weekends, and summers.

- Schools and communities should investigate opportunities for shared facilities

POTENTIAL MODELS

Here are two communities where education and community life are integrated.

The 2004 Richard W. Riley Award for Excellence, which is conferred annually by the KnowledgeWorks Foundation, went to John A. Johnson Achievement Plus Elementary School in St. Paul, Minnesota. The school is co-located with the YMCA and uses the YMCA gymnasium and pool for physical education classes, as well as after school programs. The school also has 17 functioning partnerships that provide onsite health and educational services to children and families.

In suburban Medina, Ohio, the new high school was designed as part of a complex that includes the community's new recreation center, which was developed in partnership with the local hospital. The school's media center and performing arts center are open to the public, and the school has formed partnerships with the local library and a performing arts foundation. A number of agencies provide onsite services.

In addition, the University of Akron provides onsite college classes at the high school and is building a new facility on the Medina campus that high tech companies will use to develop workforce training opportunities.

Learning in 2020—The Center and Periphery of Learning

The World as Classroom
On a typical day, some high school students learn in "classrooms" that are not on school premises. They may spend the day at a university laboratory using a piece of equipment or at an art exhibit seeking creative inspiration for a project. They can be found at the early childhood center working on a service project or in an elementary school talking about a book with a group of beginning readers who need extra attention. Or they may spend time at a hospital, a local computer software company, a nature center, or other place of knowledge—not to get a taste of future careers through tours or low-level tasks—but to participate in the inquiry, learning, and practice of knowledge workers and to take away knowledge and insights they can use in their own learning.

Continuous Learning
After the regular school day ends, students flock to an array of after school programs. Some must focus some time working with a tutor or engaging in other opportunities for mastering the basic curriculum. Others must spend time with a guidance counselor or mentor. But all have a wide range of choices for enriching their understanding of the world, expressing their individuality, helping others and serving their community, and forming positive social bonds. Some take courses and participate in seminars to supplement the learning that occurs during the school day. Some are engaged in science projects, arts activities, or sports. And with school as a central hub, many are able to obtain transportation to Junior Achievement, 4-H, or other activities not offered at the school facility. Students who are more advanced in age, competency, and maturity often create individualized plans for developing their talents, exploring careers, and pursuing some of their postsecondary learning goals.

The 21st Century Village Green
Parents arrive after work, often sharing meals with one another. While their small children play nearby or attend programs conducted by a local library, arts organization, or park, they join other members of the community in computer classes, writing workshops, or book discussions. Some earn college credits through classes with visiting professors from a nearby college or university, and others learn to read.

Students and adults enjoy a diverse array of cultural exhibits and events that reflect the community's heritage and creativity. They join study groups or dialogue sessions to explore areas of interest or civic issues that affect their lives. Young couples learn from experienced older adults who are experts in cooking meals, repairing a car, fixing a sink, or balancing a household budget. New parents learn the value of stimulating environments, play, conversation, and picture books for young children. Elderly people are sharing their wisdom and expanding their circle of friends. Families in crisis are encircled by caring friends who share their burdens, providing those small acts of kindness that often are all that's needed to avert disasters.

Why do they come? Because they recognize that being part of the school community is good for their children—and because there are so many things to do and people to see.

Creating a Supportive Network for Children and Youth
What if communities and the larger society wholly committed to realizing the ideal of "no child left behind" and also to a broader vision—"no adolescent thrown away"?

South Carolina, like a number of states, has persistently low rates of high school graduation and college enrollment. These persistently low rates will change only if families, educators, the faith community, community and civic groups and senior citizens help young people aspire to success and support their efforts.

According to the Education Commission of the States (2001), "a number of credible studies offer evidence that enriched, high-quality early care and education programs have long-lasting effects on participating children."

Expanding Learning Time and Opportunities

Research indicates that the brain development of infants and young children includes several critical periods during which key cognitive abilities are "hard-wired." When the windows open amidst poor conditions—untreated health, vision, hearing, and coordination problems, unstimulating or chaotic surroundings, or unhealthy, threatening situations—later learning will be affected. Effective 21st century schools and communities will minimize such disadvantages in children's lives by making available to all families high-quality prenatal and health care and child care, as well as diagnostic screening for preventable disabilities.

Helping Parents Get More Tools to Advance in the Work Force

Effective 21st century schools and communities will help prevent risk factors from entering many children's lives by helping parents and caregivers become self-sufficient and financially stable. Those in disadvantaged areas will provide a range of services from adult or family literacy programs to training in basic job skills to more advanced technical training or degree programs that prepare citizens for the demands of the new economy.

Example—

The Ohio Bridges to Opportunity Initiative (Bridges) is transforming state policy so that more working adults earn the education and credentials necessary to succeed in a knowledge-based economy. The success of Bridges depends on Ohio's workforce education institutions working together more closely and better aligning their various missions — workforce preparation, degree education, and remediation — in ways that better serve Ohio's low-wage working adults and their employers.

Connecting to Services and Supports to Help Students Succeed

Educators must make every effort to teach students whose lives are in disarray, but often the search for ways to support a student's learning takes an educator on a circuitous journey—through the district's or state's system of available safety nets, through state laws and regulations, and even through the mysteries of medicine, the halls of justice, and the maze of social service and mental health programs. Too often, an educator makes the journey alone, setting aside activities that would enrich the lives of all students in order to save the life of one.

Effective 21st century schools and communities will find ways to address the obstacles students face—whether those obstacles stem from mental health challenges, family circumstances, neighborhood conditions, or students' own decisions.

Successful 21st century schools and education systems will build relationships and develop advocacy strategies leading to an interconnected, comprehensive network of supportive

services and programs for children and families. They will participate actively and collaboratively, as well as play a leadership role, in providing services that "grow deep roots in the community" (Schorr, 1997). Those programs will be:

- Based on approaches proven to be effective,

- Delivered immediately and with the appropriate intensity to each child or adolescent who needs them and continued for as long as needed,

- Integrated when a child or family needs multiple services,

- Sustained through well-coordinated follow-up for individuals and evaluation processes that determine what works.

POTENTIAL MODEL

Some states provide funding and support for family resource centers by pooling funds from diverse sources and encouraging public-private funding partnerships. Communities decide when, where, and how to provide services.

In Kentucky, Family Resource and Youth Service Centers are located near public schools in high poverty areas. The primary goal of the centers is to bring resources and support to families to strengthen the functioning and enhance the growth and development of individual family members. Core components include full-time preschool for children two and three years of age; after-school care; support and training for child care providers; a program for new and expectant parents; a family literacy and parent education program; and referrals to health and social services. Youth service centers serve children over 12 years of age and are mandated to provide referrals to health and social services; employment counseling, training, and placement; summer and part-time job development; family crisis and mental health counseling; and drug and alcohol abuse counseling. Centers may provide the mandated components directly or indirectly via referrals to other agencies. In California, about one-third of the elementary and middle schools have comprehensive after school programs that are supported by school-community partnerships and state funding. In the next several years, the state plans quality after school programs in most elementary and middle schools in the state, giving children and youth a safe, academically enriching learning environment. Such programs are an excellent first step toward more comprehensive community learning centers in school facilities.

Recommendations for Systemic Change and Support

Encourage schools to organize in ways that promote personalization.
- Reconfigure school size, organization, and scheduling to promote positive relationships among all members of a school community.

- Provide incentives and added flexibility for schools to develop strategies that personalize the educational experience.

- Develop approaches to fund small learning communities for high school students.

Invest in early childhood education.

- "Raise the bar" for our society's support of its children by aligning early childhood education policies with the position of the National Association for the Education of Young Children (2003), which calls for "an integrated, well-financed system of early care and education that has the capacity to support all children's learning and development, including children living in poverty, children whose home language is not English and children with disabilities."

- Explore ways for all schools from preschool through college, as well as for hospitals, businesses, and community organizations, to collaborate in providing funding, space, and well-trained staff for safe, nurturing, innovative preschool education centers that serve all children regardless of socioeconomic status.

- Increase funding for services aimed at preventing the circumstances that place children at risk.

Create a variety of community partnerships to enhance programs and services for children and families and use school buildings as the central hub for those programs and services.

- Fund and promote innovative community partnerships that offer a range of after school programs for students, as well as strategies for ensuring students are transported safely.

- Provide professional development for principals aimed at improving their skills as community organizers.

- Encourage nonprofit organizations and higher education institutions to develop a comprehensive plan for meeting the most pressing social needs in communities, regions, and the state. The plan should include ways to fund and promote community efforts to provide comprehensive, integrated health, educational, and social services and to provide some services at school facilities.

- Engage groups planning community and regional development initiatives in envisioning schools to be multi-use public spaces where important community needs are met during the school day and during the late afternoon and evening hours. Include feasibility and cost/benefit studies for multiple uses in all planning for new school construction.

- Aggressively promote the use of high school buildings for community college courses and adult education courses.

- Sponsor educational programs and events for all citizens, including strategies that address obstacles to adults seeking training and education.

Learning As a Pursuit of Understanding and Capability

Those who are succeeding in today's economy are engaged, continuous learners. They are curious when faced with a problem and fascinated when exposed to new ideas. They are confident when challenged with a new task. They compete for the most challenging projects. Each day, they draw upon the knowledge they have and apply it in different ways, continually crossing from the methods of one discipline to another and experimenting with a variety of approaches. They enjoy generating creative new ideas and using their ingenuity and entrepreneurial skills to make those ideas work. When they face difficult challenges, they confer with peers about possible solutions, each bringing a unique set of skills to the work.

This type of career profile is becoming more prevalent, not only because the industries that employ such workers are growing but also because such ways of working are beginning to

be the norm in all types of jobs, including manufacturing and customer service environments.

To prepare for these careers, students will need to learn the meaning of *pursuit.*

Becoming educated should be more than absorbing information and demonstrating skill. It should be a pursuit of understanding and capability—an active, self-motivated process. Students' learning experiences must always leave them with more than knowledge. Learning must also be the realization of connections and patterns and the adoption of skills and habits of mind needed in order to adapt to any new learning task.

Perhaps learning experiences in schools can once again become each individual's quest for knowledge.

Learning in 2020—The Pursuit
The serious pursuit of understanding can be hard work, but this group of young children has what it takes. They are planning to reenact pioneer village life as one of their projects and are hungrily seeking knowledge that will make the experience interesting, authentic, and exciting. Today, they are composing a list of questions to answer about the history of the area so that they can begin to consult books and online resources to ensure that all is realistic. With most of their learning goals for the day met, they begin to seek enrichment. One future entrepreneur asks if he can set up a store that actually sells items to those who attend the reenactment. A budding musician offers to perform traditional music from the era on her violin. Another student volunteers the help of her mother who makes real wool yarn on an antique spinning wheel. Several of the boys vie for the position of traveling explorer; even though they will have to research historical events of the time to be sure their tales of life on the frontier are authentic.

Soon their spirit of adventure leads them to propose exploring a nearby meadow. Imagining it as the site of their village, they begin to plan how to analyze the terrain for the best use of the land, an excellent science investigation, and how they will divide the land equally, a mathematical undertaking that will bring fractions and measurement to life.

Reframing the Content of Education to Meet the Future

What if acquiring deep understanding of important concepts and developing a varied range of cognitive abilities became the focal points for education?

Few of the scientific and technical advances that are shaping the 21st century economy and society can be claimed by a single discipline. Electronics, advanced materials and nanotechnology, "smart" pharmaceuticals, "designer" crops, and biotechnology devices all emerged and are advancing through interdisciplinary work.

IMAGINE

Every child's entry into kindergarten comes after an early childhood of stimulating, positive discovery and learning experiences—at home, in preschool programs, and in innovative community-based programs.

The thinking of teams and businesses that used those advances to create new industries and jobs and to develop new products and services was even more diverse. In fact, many of today's knowledge workers in service or creative jobs easily cross the boundaries of disciplines, connecting diverse knowledge as they assess problems, sensing and evaluating changes in the culture, innovating, and creating new forms.

Effective 21st century schools will provide students with learning experiences that transcend the subject-by-subject orientation.

Focusing on Core Standards

Effective 21st century schools will focus intensively on ensuring that students gain increasing levels of competency in reading, writing, and mathematics—the fundamental tools for understanding, thought, and expression. By achieving mastery of these fundamental tools, students will open the door to all knowledge.

Education systems and schools will invest whatever time and resources are necessary to ensure that every child meets essential standards in those areas. From preschool on, all students will receive ongoing diagnostic services, and what is learned will begin a series of interventions, each with an intensity and duration that is based on the child's needs, each measurably advancing the child toward a challenging and important developmental goal.

Educators will use assessment to differentiate instruction. They will share ideas about how to help students and engage in intensive professional development. Systems will be in place to enable immediate intervention for students who continue to struggle. State accountability systems will focus primarily on the literacies represented by those standards.

According to a report from the President's Commission on Excellence in Special Education (2002), about three million children are receiving special education services for a "specific learning disability," and a high percentage of them have been placed in this classification simply because they haven't learned how to read.

Seeing Standards Differently for a Changing Economy

In effective 21st century schools, standards will provide a useful framework for classifying information about the world. While students will recognize the importance of the information and will pay some attention to embedding the frameworks in their mental models of the world, they will spend more time exploring small sections in depth, using the tools of language and mathematics to enhance their understanding, finding connections and relationships independently, and using the disciplinary knowledge that they gain in their investigations.

Looking at the World

The quest for knowledge also will incorporate some new or expanded literacies and skills that can provide powerful ways to gain and use knowledge. Because technology use is increasing, the ability to navigate hypertext is now an essential skill, and constructing hypertext communications for use on the Web is basic in knowledge and creative industries. The ability to develop video or multimedia presentations also is becoming more common.

Effective 21st century schools also will recognize that students in 2020 will need the ability to speak a foreign language, understand the perspectives of other nations and cultures, learn entrepreneurial skills, and gain an understanding of the economic forces that shape their lives.

Emphasizing Cognitive and Creative Processes

With the capacity for instant access to knowledge, educators in effective 21st century schools will focus less on "delivering" the knowledge reflected in the standards and more on helping students access and use that knowledge when they need it to meet their goals. The complex abilities that are needed to understand and use information as workers, citizens, and parents will be central. Learning experiences and assessments will use much of the content found in today's standards for developing students' abilities to:

- Define problems or questions in ways that aid further inquiry.

- See patterns and relationships in complex situations—and then recognize those same patterns and relationships in completely different situations.

- Form hypotheses and design ways to test them.

- Understand a novel, poem, or other work of art with keen insight and apply its themes to the world as experienced.

- Critically engage with texts, speech, and images from the news media and the advertising industry.

- Analyze information—taking it apart systematically to see its major threads, as well as its subtle undercurrents.

- Synthesize information within and across disciplines to stimulate new insights and ways of looking at a situation.

- Use specialized knowledge, tools, and techniques to make complex decisions or do meaningful work that serves social, political, psychological, artistic, technical, or economic functions.

- Apply existing knowledge to create an ingenious solution to a problem, improve a product or process, or find a new way to perform a task.

- Envision new possibilities and represent truths in new ways.

At times, groups of students will work with the same facts and concepts as they develop and use their thinking and creative skills. But often, each student will be working with a completely different set of information as they explore concepts and questions that have interdisciplinary connections.

IMAGINE

Students seek academic content out of curiosity or interest in a question or problem. Their own thoughts provide compelling reasons to read and comprehend texts. Their desire to investigate theories that intrigue them draws them to mathematical methods. Their excitement about the original ideas they conceived spark the desire to write clearly and persuasively.

POTENTIAL MODEL

The mission of Dayton Early College Academy DECA, one of the first institutions of its kind in the United States and the first early college high school in Ohio, is to maximize each student's unique potential through a personalized, accelerated academic program.

Besides being part of a well-rounded high school curriculum closely aligned with Ohio Academic Content Standards, students can take up to two years' worth of college courses — free of tuition — with academic support provided in various forms such as study groups, mentoring, tutoring, and individual instruction.

In DECA's first year alone, 22 of its students — all ninth-graders — completed 33 college courses at the University of Dayton and Sinclair Community College.

Adapting Learning Processes to Learners and the Changing Times

What if all students valued school because there they find answers about what matters to them?

Young children are engaged, joyful, continuous learners. If our education system can keep them that way, they will be prepared to adapt to the new challenges they are sure to encounter in the decades to come. Unfortunately, some students stop learning when their difficulties are not addressed, but others simply lose interest in school, becoming passive and unmotivated. Some become completely disengaged from school—and more likely to be truant, fail, or drop out.

Educators in effective 21st century schools will win students back from boredom and distraction by providing more individualized learning experiences.

Varying the Learning Experience

Educators in effective 21st century schools will use a variety of strategies to individualize learning and engage students:

- Connecting what they learn about students' experiences and interests to academic content and learning processes to provide an immediate value for learning.

- Using out-of-school literacies to encourage reading, thinking, and discussion.

- Providing multiple entry points (Gardner, 1991) to draw students into content and differentiating instruction to accommodate different learning styles.

- Finding materials that fit individual students' reading levels, interests, and learning styles

- Working with fluid, task-appropriate groups and providing layers of support from peers, mentors, electronic resources, and staff.

Changing Testing and Assessment to Match Changing Demands

Students and educators in 21st century schools will co-design creative, highly individualized assessments that will enable them to enact "performances of understanding" (Gardner, 2000). By observing learners at work and examining what they produce, an educator will be able to collect detailed data about their knowledge, understanding, and skill and assess their progress toward the next phase of their learning.

Students will collect electronic portfolios of their work that contain not only written artifacts but images, sound recordings, and video. They will be able to look back and see evidence of their own progress, as well as feedback from teachers. Using a system of rubrics that reflect the cognitive and creative processes to be mastered, educators will monitor students' progress as they expand their repertoire of knowledge and skills.

Students will receive not only information about the quality of their work but also valuable feedback on how effectively they approached a complex task, solicited the advice of others, pursued inspiration, experimented with ideas, made choices, and corrected errors or ineffective strategies. Consequently, their learning will be deeper, and they will reflect more often on their work habits.

Learning in 2020: Fluid Groups and Individualized Assessments

As a way to prepare for an upcoming formal presentation, a team of learners explains a project they are completing to another group of less advanced learners. Their teacher takes advantage of the exchange to collect assessment information. With his digital video camera, the teacher captures their interactions as they answer the younger students' questions. Later, he will quickly transfer video clips of both the questioners and the respondents to their individual electronic portfolios and their shared project documentation portfolio.

The clips will be useful in assessing three students' individual and group performances on this project. Based on the goals they had targeted in their learning plan for the project, an assessment of their skill in clearly communicating and defending their results is part of the individualized, multi-dimensional, performance-based assessment during and after their project. Other team members chose different assessment criteria.

For most of the team, the major learning goal for the project is to advance in their ability to form testable hypotheses and to identify and select variables and conditions to manipulate

and control. To examine their reasoning and work processes, their teacher has been not only reading their progress reports and interacting with them but also analyzing audio files of their work sessions and retrieving their sketches from the electronic whiteboard.

One team member, however, has made a different choice after recognizing that he was not yet ready to grasp the statistical techniques his team members were using to formulate their predictions. He chose to remain on the project as a documentation specialist. Unlike the other students, he will receive a detailed assessment of improvements in his research and explanatory writing skills with only minor emphasis on his statistical skills. He has been working on those with a study group and carefully observing his team's work. His statistical analysis skills will be assessed later when he plays a more substantive scientific role in a future project.

Reframing the Experience of Education

What if learning were more "experiential?"

The process of innovation depends upon people's capacity to enter a state that psychologist Mihaly Csikszentmihalyi (1990) calls "flow," in which a person is wholly involved and using his or her skills to the utmost. Flow creates "a sense of exhilaration, a deep sense of enjoyment that is long cherished and that becomes a landmark in memory for what life should be like." According to Geoffrey and Renate Caine, the brain learns best when knowledge is "embedded in multiple, rich, interactive experiences where most of what is to be learned is left open-ended, ready for discovery by and consolidation within the learner" (1997).

IMAGINE

Instead of breezing through a museum, students spend several days there, exploring individual paintings and sculpture but also exploring concepts and ideas in history, science, mathematics, and literature through art. Instead of looking at fifty science displays

Students in effective 21st century schools will know what it is to experience the exhilaration of flow. They will prepare for conceptual, creative, complex work by experiencing such work as they learn.

Supporting Varied Ways of Knowing and Expression

Speech and reading are only two of the information sources and communication media available to 21st century workers and citizens. Therefore, effective 21st century learning and communication of ideas will include the use of pictures, videotapes, audio tapes, computer programs, simulation games and manipulatives.

Furthermore, students in effective 21st century classrooms will have more freedom to choose the arts as a way to encounter information and concepts and to express ideas. That choice will mean a much deeper encounter with knowledge, ideas, and concepts for many students.

According to Nick Rabkin and Robin Redmond (2005), the arts link cognitive growth to social and emotional development and "develop the tools of thinking itself: careful observation of the world, mental representation of what is observed or imagined, abstraction from complexity, pattern recognition and development, symbolic and metaphoric representation, and qualitative judgment." A study by Shirley Brice-Heath (1999) showed that introducing high-quality after school arts programs for urban students has led to dramatic improvement in linguistic skills, as well as in self-respect, self-efficacy, positive peer associations, and resistance to peer pressure. Other studies have reported improved writing (Olshansky, 1995), improved SAT scores (College Board, 2000), and better attendance and behavior (Welch and Greene, 1995).

Jeffrey Hawkins, a computer architect and founder of the Redwood Neuroscience Institute, says the mind can be "trained" to be more creative. But his approach is the antithesis of school: "Assume there is an answer and don't give up . . . . Let your mind wander. . . . Go away for awhile," he says. "You need to give your brain time and space to discover the solution. Finding a solution to a problem is literally finding a pattern in the world."

Learning in 2020: Different Ways

Today, one group is discussing poetry and images with a local poet. Another is conducting a debate on a bill before Congress with a local politician. Some students are interviewing a 90-year-old lifelong resident of the community about her childhood and the stories her parents told. In this community, participating in such inter-generational exchanges is a common learning experience during the early years of schooling, so secondary students often decide to include elders or their own parents in their projects as well.

Using Technology Thoughtfully

In effective 21st century schools, the presence of most of the technologies we know today will be transparent and no more noticed than pencils and notebooks. Because technology will change so rapidly, schools will focus less on teaching students how to use specific technologies and more on:

• Learning about technology—Learning generally how to approach mastering a new device or software product, how to evaluate a technological product they are using, and how to analyze the potential and actual effects of a particular technology on the economy, society, and individual lives of citizens.

• Learning with technology—Using technology to increase the number and range of people who play a consequential role in a meaningful activity, to present original ideas in more compelling ways, and to access, organize, and process information used in projects.

• Learning through technology—Using technology as a tool for extending thought, exploring the imagination, playing creatively with ideas, and operating in virtual environments that allow learning experiences not otherwise possible.

Learning in 2020: Simulation, Participation

Students are crowded around a large screen as they run an educational computer simulation. They watch with great interest the vivid pictures of a modified meadow ecosystem they designed. As this simulated ecosystem advances through ten years of growth and development, they scan the screen anxiously for evidence that the number of endangered birds living there is declining, waiting to see whether the food supply they introduced will negatively affect other species.

On the screen, yellow coreopsis in a nearby meadow spread and new butterfly species arrive each year. As two ruby-throated hummingbirds descend on the flowers, visual learners look at the numbers that had been puzzling them with new understanding. A teacher quickly moves to their side to point out the equations that predicted this.

The industry team that developed the simulation software will be visiting next week. They have been working with ten groups of learners across the state who have used the software to investigate the "at risk" ecosystems of small bodies of water in their communities. The

successful investigations, each blending scientific knowledge with creative inquiry, will be downloaded into several electronic textbooks being used by students across the nation. The team knows their work will be published eventually—after all, electronic textbooks can be updated any time to keep pace with new knowledge and present more challenging problems. But they hope that theirs will be among the first simulations to appear in a new interactive life sciences text.

Supporting Inquiry, Investigation, and Projects

According to Robert Hassan (2003), our society is no longer dominated by clock time but has shifted to the compressed time of digital technology. This "chronoscopic society," says Hassan is resulting in "abbreviated thinking" that is focused on utility of thought rather than on critical reasoning. Rather than follow this digital reality, which may be more prevalent in the 2020s, effective 21st century schools will promote a quest for understanding through in-depth thought and problem-solving. In this way, students will develop the habits of mind they need to succeed as workers, citizens, and parents.

The basis for more in-depth thinking and problem-solving will be not only encounters with texts and well-designed presentations of information by educators and experts but also rich experiences that interest the student. Although other "inputs" to the learning process—lectures, textbooks, pencil and paper assessments—are more efficient and seem to contain more content, the greater engagement of rich experiences will strengthen the outcomes of the more abstract learning activities.

Those experiences will take three forms:

Inquiry—Using a range of literacies, students will inquire deeply about important questions and concepts that emerge in their experiences. As they unveil propaganda, struggle with the ambiguities and paradoxes of contemporary ethical and aesthetic questions, and examine their own lives through inquiry, a desire for wisdom will awaken in them. Some will be impelled toward a search for scientific answers. Some will be inspired to create works of art or invention. All will form a personal vision that motivates in-depth learning.

Investigation—Students will investigate complex problems using the tools of science and mathematics, research skills, and critical thinking skills. To support their theories, hypotheses, opinions, and ideas, they will read widely, communicate with experts, and search the knowledge frameworks of the disciplines. They will experience how a variety of knowledge professionals think and approach problems. Walking with a learned guide on a path they *think* they know, students will begin to develop a curiosity and a sense that exploring the content of the disciplines is a way to have more rewarding experiences.

Projects—For students to experience what a KnowledgeWorks team calls "pursuing positive purpose with passion," schools must provide opportunities for students to create and direct their own projects (Strickland et al, 2005). Through projects, teachers will be able to differentiate the learning experience so that each student is both challenged and rewarded for effort. Rather than highlighting some students' ability to complete a task with excellence while others are unable even to complete it, projects will challenge all students in some area, while giving each an opportunity to experience success and increase understanding.

Projects will provide students with experience in working with others and engaging in complex communications, essential skills in the 21st century economy. Learning cooperatively, a natural part of project work, also is a powerful strategy (Marzano,

Pickering & Pollock, 2001; Johnson and Johnson, 2000). Finally, students working on projects also will discover for themselves what it takes to do good work—from the so-called "industrial age values" of attention to detail and neatness to 21st century innovation and global thinking.

Experiences with inquiry, investigation, and projects will not only engage students but also make them more aware of *how* they think and work. Educators will incorporate metacognitive activities, which studies have shown increase transfer (Bransford, Brown, & Cocking, 1999). They also will provide problem-solving heuristics and suggest ways to collect data for improving the work or for research purposes.

Learning in 2020: Student Work

Most learners in the 12-16 age group work with three different groups each day. One explores an intellectual or creative question through inquiry. Another investigates a complex problem as a context for applying existing knowledge and skills and pursuing more advanced understanding. A third group comes together to work on a major project.

Inquiry—A typical student is part of 50-60 inquiry groups per year and is expected to keep a written journal of reflections on the experiences and write an end-of-year reflective essay that synthesizes some of the inquiry experiences. Each student must initiate and lead one week-long inquiry and complete an in-depth essay and a multimedia presentation on the thinking that occurred. Each also participates in 3-5 inquiry groups that meet at several intervals throughout the year to discuss the products of ongoing reading, writing, or creative or critical work pertaining to the question.

During the last years of secondary and the initial years of post-secondary education, learners usually design their own series of in-depth inquiries around important themes and concepts.

Investigation—With investigations, students develop their knowledge and apply their skills in more integrated ways. They may focus on broadening their conceptual knowledge within a discipline or deepening their understanding through an in-depth encounter with a work of fiction or art, a review of research pertaining to a topic, experimentation with the capabilities of a computer tool, analysis of a theory, or actual experience and practice in a context where the inquiry is highly relevant. In high school, a learner may engage in two or three in-depth investigations in a year, always covering a range of disciplines. High school age students, and even some who are younger, typically cross back and forth between high school level courses and college courses. (Some college students also go back to high school for a refresher.) Some classes are taught collaboratively with secondary students and college students attending separate classes some days and joint classes other days. Beginning in elementary school, all learners must pursue an ongoing investigation in three general areas—1) their own physical and mental health; 2) their views on relationships, marriage, and family life; and 3) a vision for their community or nation.

Projects—Learners also spend part of the day working with their project teams. While investigations are focused more on learning and demonstrating knowledge, projects require high-level applications of knowledge and skills in multiple areas, creative thinking, team work, communication, leadership, and the development of relationships beyond the immediate learning community. Usually projects focus on in-depth research using the methods of one or more disciplines or the design of tools and approaches that address complex problems.

As learners advance, the scope of the projects they experience widens and their project roles and responsibilities become more challenging and complex. As a learner moves toward adulthood, projects more closely reflect his or her career or higher education plans. In some cases, a learner leaves the learning community at age 16 to do a project in another country or natural environment or to gain some work experience.

Connecting Learning to Careers

According to Carnevale and Desrochers (2002), today's schools are missing a middle ground between academic learning and vocational learning. In most high schools, "college-bound students continue their studies by moving up in the hierarchy of academic disciplines taught in isolated silos via abstract methods, while general academic content is missing from many high school vocational and general education curricula."

Students in effective 21st century schools will experience themselves functioning in authentic career contexts and interacting with knowledge for real purposes. Businesses and other types of knowledge organizations will be much more active in helping to create in-depth learning experiences in which students encounter some of the problems and challenges that surface in their operations. With their greater embeddedness in communities, schools will benefit as public institutions, such as museums and zoos, make their facilities more available for in-depth learning activities and develop more mobile environments and toolkits that can be used in schools.

Providing Opportunities for Developing Responsibility and Service

Developing "know-how" is important, but equally important is preparing students to find purpose and meaning in life, consider their generation's contributions to history, and cultivate caring, ethical relationships with others.

Effective 21st century schools will help students experience the kinds of leadership and service that create a civil, just, and wise society. They will be activated and animated, in the words of educator Paul Cummins (2004), through "continuous involvement in undertakings of importance to them." They will serve others through roles such as peer tutoring and mentoring, and they will join the retired but active "baby boomers" in serving their communities.

Learning in 2020: The Transition to Adulthood

During the last years of secondary education and the initial years of post-secondary education—or as soon as a learner has met secondary graduation requirements and decided on a career direction—he or she is matched with a team that is responsible for helping to develop the competencies required for a challenging entry-level job and advanced studies. A learning leader with appropriate content background and a practitioner in the field are always ongoing members of the team. Others who may join the team for an interval include an expert in the field, members of communities or organization likely to be served by the field, and peers from other investigations whose career paths are likely to intersect with those pursuing the learner's chosen career. For example, a learner with the desire and background knowledge to study pediatric medicine will work with a learning leader in the life sciences and a pediatrician. The learner may spend time learning from or with medical students, pediatric nurses, a hospital administrator, young patients and their parents, and another learner who plans to enter nursing.

Recommendations for Systemic Change and Support

Ensure that all children learn to read proficiently.

- Create an effective, comprehensive system of early childhood education for all children that employs qualified teachers and provides prevention and intervention programs for the range of risk factors young children face.

- Provide high-quality, research-based instruction reading, writing, and mathematics and frequent assessment during the early grades to ensure that all students are prepared to succeed.

- Provide intensive intervention to all students who struggle in reading during the early grades and continued support in reading for older students with reading problems.

Engage in continued dialogue at all levels about standards, continually re-examining them. Through this dialogue:

- Identify those standards that are most essential. Make meeting those standards the focus of the accountability system.

- Explore ways to communicate how the standards connect to issues that affect or interest students, to cultural characteristics and emerging cultural trends, to natural and man-made places in communities, to relationships in communities, to the industries, jobs, and scientific pursuits within the state, and to other areas relevant to students, families, and schools.

- Explore the cognitive and creative processes that are implicit in the standards.

Set policies and organize the education system to encourage and support more individualized and varied learning experiences.

- Provide all educators with the time and support needed for creating more differentiated learning experiences.

- Redefine education as a P-16 system with much more fluid boundaries between middle school, high school, and undergraduate education.

- Determine the current obstacles to individualized assessment. Establish grants and initiatives that support the development and use of innovative assessment practices. Explore how technology can be used to collect and maintain more detailed assessment information.

- Support comprehensive, high-quality arts education and explore how the arts enrich other subject areas and enhance students' creativity in ways that will prepare them for careers.

- Make technology as accessible as possible to all students. Give students a voice in technology decisions and a leadership role in community-based technology training programs.

- Create a planning initiative to define a gradual transition to more project-based, self-managed learning environments. Begin to explore the use of inquiry, investigation, and projects in after school and summer programs.

Educators as Creative, Collaborative Learning Leaders in Adaptive Systems

To operate in the new economy and serve the society it is shaping, organizations and systems must become adaptive, exhibiting the characteristics of biological systems as they continually interact with their environment and make the changes necessary to thrive (Meyer & Davis, 2003). Adaptive businesses are self-organizing, with the innovations of individual knowledge workers determining organizational structure and system operations. They "learn from the world" like the metanational corporations that look for "relevant pockets of knowledge dispersed around the world" (Doz, Santos, & Williamson, 2001). They tolerate what economist Joseph Schumpeter called "creative destruction," allowing highly adaptive new ideas to rapidly replace less adaptive strategies.

To create opportunities for the learning experiences students will need, educators and education systems must become adaptive as well. Schools and systems will need to become more team-oriented with projects and learning as the impetus for forming teams. They will need to encourage continuous innovation among all their employees and create an environment and culture where teachers are trusted, ideas flow freely, and spontaneous collaboration is frequent. They will need to look for sources of knowledge and ideas in other domains and engage markets, communities, culture, and society.

Perhaps schools will become hothouses for innovation.

Learning in 2020: Adaptations

A group of education leaders, most from schools in central South Carolina, are meeting for a three-day summit. Several are accompanied by members of their staffs, as well as by parents and students who have interesting ideas or knowledge to share. Several breakout groups are forming to look critically at assessment data from student projects—data each believes represents a high degree of student success in meeting one or more of the core standards. Later, they will have in-depth discussions with business leaders, who will educate them about employment trends and share their observations about how recent entrants to the workplace approach problems. Some will decide to work with schools on authentic assessment tasks that reflect work in their industries.

On day two, the focus will be an exchange about technology. Representatives from computer and software companies will be present to ask questions and listen to concerns about a new type of electronic paper the schools have been testing.

Finally, they will spend the third day engaging deeply in dialogue and reflection. Although all are busy, they know it is essential to step back and examine their assumptions.

Rethinking Educators' Roles

What if educators functioned as learning leaders?

IMAGINE

Excellent teaching is viewed widely as an endeavor of science and mystery, analysis and intuition, action and reflection, technique and improvisation. It is knowledge work at its fullest.

Consistently creating learning experiences aimed at deep understanding and development of complex cognitive and creative abilities will require educators to adopt the role of "learning leaders."

The role of a learning leader, a title used by Barbara Barnes (1999) to describe teachers in her project-based EFG approach, reflects a shift away from the traditional "teacher" role in which students enter the classroom at a set time each day to receive

26

information, "delivered" by the same person that delivered yesterday's, engage in some limited practicing of skills, and receive concise feedback.

Learning leaders in 21st century schools will need to shift from one role to another in a school day and throughout the school year. Some of their roles in the learning process will include:

- **Subject matter expert:** Recommending information resources or introducing and explaining concepts and ideas as they arise.

- **Designer:** Enhancing students' learning by engineering a project environment or creatively developing complex problems to solve.

- **Liaison:** Linking students to others doing similar work or with available facilities and equipment they may need.

- **Facilitator:** Guiding dialogue and discussion.

- **Advisor:** Suggesting supplemental learning experiences, acting as a sounding board, asking probing questions.

- **Evaluator:** Continually assessing students' products, performances, and processes, including their thinking and reasoning processes, and providing learners with appropriate, useful feedback that will provide a scaffold to continued or more advanced learning. As evaluators, teachers may play roles similar to project leaders in business or community settings, clients, critics, or others who would observe and receive the results of a student's work in an authentic situation.

Learning in 2020—The Role of the Learning Leader

Learning leaders involved in inquiries, investigations, and projects perform a variety of roles, including recommending information resources or helping students search for them, facilitating some of the dialogue and discussion, introducing and explaining concepts and ideas as they arise, and asking probing questions. They often link the groups to other learning leaders, learning experiences, or facilities and equipment they may need. The learning leader's most important role, however, is continually assessing students' products, performances, and processes, including their thinking and reasoning processes, and providing learners with appropriate, useful feedback that will provide a scaffold to continued or more advanced learning.

Rethinking Professional Culture

What if faculties functioned as learning organizations? What if the work of educators were more fluid and flexible?

IMAGINE

Teachers create ideas and innovations that shape the future. They hold "dreaming sessions, where they create a vision for 2040 and beyond."

"Ownership and entrepreneurial spirit . . . easy to understand values . . . opportunities for interaction . . .different forms of learning opportunities" are the distinguishing features of new organizational cultures, say Adolf Haasen and Gordon Shea (2003).

"Intellectual exchange, a free flow of ideas among all members of the organization, cultivation of mentoring relationships, and recognition of "thinkers and products of thought," is Barton Kunstler's analysis of

"creative hothouses" throughout history, including some of today's innovative corporations (2004).

Effective 21st century schools will stimulate such collegial and creative environments by:

- Giving learning leaders, as a professional community, time to examine rigorously what it means to do good work and trusting them to do it.

- Giving educators opportunities and encouragement to develop new skills and approaches for creating learning experiences and supporting them both in exploring beyond their own disciplines and narrowing their focus to develop in-depth expertise in an area.

- Expecting educators to document their work and share it with others—and valuing what they produce.

Learning in 2020: What Are Some Learning Leaders Doing?

A high school staff includes educators who are focusing on more in-depth and up-to-date knowledge and expertise in their disciplines and others who are more focused on integrating learning in different disciplines. One of their colleagues, along with a team of high school and college-age students, is spending six months in Arizona, studying the history, culture, literature, and art of Native American tribes. They will return with a video segment that will be part of a documentary being produced in collaboration with public television and the university's anthropology department.

A team of elementary school teachers are designing a new approach for helping students develop their critical thinking skills. They create a schedule for working with students that allows each member of the team to have a week for focusing exclusively on the project. Later, they will revise the schedule so that team members can observe and coach one another as they use the approach with students.

A middle school educator is taking a year away from working with students to explore a new technology that has tremendous potential for improving students' learning experiences. She will then teach colleagues how to incorporate this technology. Another colleague, who has outstanding abilities in conducting Socratic inquiry, focuses exclusively on that area, moving continuously from high school groups to elementary school groups to groups of parents and colleagues. His sessions are videotaped so that others can learn from him.

Rethinking Connections and Partnerships Outside the School

What if educators were "collabronauts?"

According to Rosabeth Moss Kanter (2001), who wrote on the "digital culture of tomorrow," most high tech firms have departments dedicated to searching for ways to collaborate. She calls the "deal makers, ambassadors, and acrobats" who staff these departments "collabronauts."

Educators in 21st century schools will function in that way as they create the learning experiences that will prepare students for the 2020s.

Educators as collabronauts will bring schools into the flow of knowledge creation and innovation, helping students gain access to the world of knowledge-intensive work while

IMAGINE

Students observe live or via videoconference the creative atmosphere of magazine writers pitching stories to their editor, the intensity of a scientific team as they examine new data, or the wide-ranging intuitive insights of visual artists as they plan a public mural.

solutions to complex, ambiguous problems are still being sought. The role may include such activities as:

• Working with colleagues to develop projects or learning experiences that integrate the knowledge and skills of different disciplines.

• Working with industry teams to create new computer tools that enhance students' learning experiences.

• Working with subject matter experts from universities to capture their knowledge and ideas for use in the classroom.

• Working with a parent to develop learning experiences related to the parent's job, industry, hobby, or life experiences.

• Forming collaborative relationships with students that produce projects for the students and job-embedded professional development activities for the educator.

Expanding Opportunities, Choices, and Connections

Although proposed as a stimulus for reform, what is now called "school choice" is seen by many as a win-lose proposition in an arena where society cannot afford to have anyone lose and a punitive tool to use in coercing failing schools. Educators who are collabronauts working in schools that are centers of community can lead a movement to expand choice *within* schools.

Instead of the "all or nothing" competition of today, educators can help create a culture of "co-opetition" in which competing entities cooperate to achieve goals that benefit all.

Such an atmosphere would encourage innovation—which is sparked by competition but fueled by an environment that allows risk. Instead of escaping a failing school into the unknown, parents would have the opportunity to "customize" their children's education. In the more individualized classrooms of schools that pursue understanding, they could exercise choice by guiding their children in their selection of learning activities and resources. As a result of the various collaborative relationships among educators and community groups, parents also could choose from an array of learning experiences offered by other teachers in their children's schools, by entrepreneurial educators from other schools who have created an innovative unit or project, and by private entities.

Going International

Successful 21st century schools will explore the best practices of schools in other nations and experiment with adapting them. Much of our nation's mediocre performance on the Third International Mathematics and Science Study (TIMSS) has been attributed to our "mile wide and inch deep" curriculum. Yet our schools seldom try the best practices of other nations.

Setting the Technology Direction

In the 1990s, the National Science Foundation funded efforts in the science and engineering community that represented "grand challenges" in computing and communications. As they looked for ways to solve problems that far exceeded the hardware capabilities of the day, the computing and communications industry began to follow their research direction and work with them. Educators, who know intimately the inefficiencies and lost opportunities of the classroom, need to exert a similar "technology pull."

Keeping abreast of such technologies, rather than waiting for others to configure the classroom of the future, will ensure that the nation's technology investments in this area receive the best return possible, but more importantly, that technology meets the needs of students and educators.

Pioneering New "Learning Industries"

Successful entrepreneurs and enterprises in today's economy create new markets rather than compete for a share of those that already exist. In addition, when an industry or business type creates a new market or changes the way it does business, new jobs are created. In a knowledge society, where people are recognizing the need to learn but do not want to learn in traditional ways, new education enterprises and jobs also will emerge:

- Creative content design—organizing and presenting knowledge in ways that are accessible, interactive, and conducive to allowing customization according to individual learning styles, needs, and interests

- Knowledge integration—generating new ideas by finding connections among different disciplines and contexts

- Experience architecture—designing and constructing specialized learning environments and tools that can be used to make learning more experiential.

Effective 21st century schools will support the emergence of these professions as complementary to the roles of learning leaders.

Recommendations for Systemic Change and Support

Promote educator learning.
- Develop systems whereby teachers are given periodic opportunities to lighten their schedules for intensive professional learning activities, including opportunities to conduct research and get involved in work related to the application of their discipline in business, academia, or other arenas.

- Provide teachers with funding and support for innovative professional development projects that would benefit other members of the learning community.

Entrust educators with leadership roles in recreating the education system.
- Begin to engage educators in designing alternate forms of assessment and accountability that include action research. Create significant opportunities for educators and school leaders to examine each other's results and develop agreements about what it means to show evidence of thought, creativity, and other cognitive skills needed for success in the Knowledge Age.

- Engage classroom educators in policy discussions about what types of learning experiences are needed to prepare students for the future and about what it would take to create professional learning communities.

Adopt a more proactive role in technology evolution.
- Create local and regional "think tanks" or advisory boards composed of technologically adept citizens, including students. Use these bodies in planning and purchasing new technologies. Create a technology vision for 2020 based on what students and educators say would make the learning process more engaging and effective.

- Support and help to shape technology advances that will support teaching and learning, including collaborative tools that will enable educators to share knowledge.

Concluding Thoughts

Those who are intrigued by the idea of schools as communities, learning as the pursuit of capabilities, and educators as learning leaders in adaptive systems are sure to arrive at questions such as these:

- Will the busy, fragmented communities of the 21st century ever become cohesive learning communities with a common vision?

- Will students approach greater choice and more autonomy responsibly?

- Will educators adapt to such dramatic changes in their roles and responsibilities?

The answer to all these questions and to many like them is that citizens, students, and educators will adapt to change and rise to challenges in a system with the infrastructure to support learning and the flexibility to allow innovation.

The potential for innovation that exists in the ranks of our teachers—those doing the principal work of education—is often an untapped resource in today's education systems. Trusting in their ability to find solutions and their desire to do something meaningful will awaken their creativity and their passion for excellence.

Also underestimated is the willingness of parents and community members to be part of educating our future citizens. Inviting them into schools is not enough. Schools must make a place for them—a place that is always open, always demonstrating the belief that their unique contributions truly matter.

Finally, the promise of our children is our greatest hope. Recognizing their natural love of learning, nurturing their cognitive and creative development, and honoring the vision they hold for themselves will take the experience of learning to exciting new levels.

Such changes in thinking will take leadership.

Since the launch of Sputnik nearly 50 years ago, the education system has been following in the wake of the knowledge society instead of catching the wave of its energy and innovative spirit. By looking ahead to the future of its students, South Carolina has connected to the innovative thinking that is already shaping the future of our economy and our society. Maintaining that connection may require a leap into the struggle, uncertainty, and conflict that come with the consequential change of our time. But any worthwhile change demands nothing less.

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