DOCUMENT RESUME

ED 452 685 EF 005 910

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TITLE	Programming and Design of Public Schools within the Context of Community.
PUB DATE	2000-00-00
NOTE	62p.
PUB TYPE	Reports - Evaluative (142)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	*Educational Facilities Design; *Educational Facilities Planning; Elementary Secondary Education; *Public Schools; *School Community Relationship

ABSTRACT

This paper translates the best of educational practice into school design criteria for architects and communities who wish to build innovative schools that reflect community excellence. The paper first discusses the School Zone model, an integrated system for addressing school design and curriculum. This educational system is then linked to the built, natural, and cultural environment so that the resultant architecture can act as a three-dimensional textbook. The paper then presents a survey of 16 case studies that reveal basic patterns for reform in school curriculum and facilities design illustrating the philosophical framework behind the School Zone model. Four key issues or patterns extrapolated from the studies are examined that show how involving children in the design process has implications for the role schools play in the community. Patterns for reform using design criteria from multiple sources are outlined so that communities may take action to build and evaluate programs that synthesize community and educational needs. An appendix contains research questions based on the patterns observed in the case studies are offered for further study. (Contains 50 references.) (GR)

Programming and Design of Public Schools Within the Context of Community

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Abstract

Billions of dollars are being spent each year to retrofit, renovate, and build schools in America, and yet these "new" designs are based on outmoded concepts, ignore vital ecological principles, and fail to include client input. All stakeholders, from students to community, must be involved in the programming and design of learning environments. Professor Anne Taylor, Ph.D., Hon. AIA, employs the antecedent process of architectural programming to translate the best of educational practice into design criteria for architects and communities who wish to build innovative learning centers that reflect community excellence. Taylor discusses the School Zone model for participatory planning, which establishes a system for learning across student developmental needs of the body, mind, and spirit; integrated subject matter disciplines; and learning processes. This educational system then is linked to the design of the built, natural, and cultural environment so that the resultant architecture can act as a three-dimensional textbook. A survey of 16 case studies reveals basic patterns for reform in school curriculum and facilities design: (a) democratic, broad-based community input into the programming and design process changes the configuration and design of learning environments and encourages co-location of facilities (b) as community members develop design literacy for intelligent participation in the design process, they appreciate the complexity and the benefits of restructuring schools and facilities (c) successful communities cultivate the image of young people as powerful learners, and (d) architectural planning and design techniques offer a model or map for communities to use while developing, researching, constructing, and evaluating joint school and community ventures.

Programming and Design of Public Schools Within the Context of Community

Preface

The Need for Pragmatic Synthesis

I have been fortunate to work with both children and adults for forty-plus years in the combined fields of education, design, and architecture and planning. David Orr has described the lure of this particular academic territory in his essays linking place and pedagogy (Orr, 1992). In order to live well, we must truly "inhabit" a place, rather than merely taking up temporary residence. We can know and respect a place--and ourselves--only through deep investigation and integrated thinking. As I look back on the schools I have visited, it seems to me that I have begun thinking more globally, while at the same time acting in an increasingly site-specific or local way, to imbue our schools with form, function, and meaning at the individual and the community level.

Over the years my work has evolved into that of a programmer, or, more precisely, a facilitator of the program. By that I mean I try to bridge the gap between what the primary clients (the students) need and what the architects design, before any designing takes place. The antecedent process of architectural programming, instead of planning based on predetermined square footage needs as part of an educational specification, includes students and community input throughout the planning process, from setting goals and collecting data to determining needs and identifying the problem to be solved. When such participatory planning or programming happens, exciting new issues emerge concerning co-location of school activity settings for child care, health care, museums, art galleries, science labs, community cultural centers, studios instead of classrooms, and outdoor "learning landscapes" instead of barren playgrounds.

In this paper, I will offer reflections on implementing architectural programming and

design ideas in the real world setting of schools. I hope to motivate and inspire others to "get out there" and do something with the research that is being generated in massive amounts every day. To my view, what is lacking in the literature is more a matter of synthesis than of a topical nature. What we see too often are increasingly narrow and focused studies accomplished by specialists working in isolation. This is the blessing and the curse of the information age. The research might be fascinating and well-meaning, but it doesn't trickle down to classroom practice, or to architects who are looking for futuristic ideas. What we need is a system for assembling these theories into a coherent and practical tool for restructuring education and educational facilities within the context of community.

Introduction

Developing Programming and Design Capability

Communities seeking to design schools for the future must think in an integrated manner to join the goals of education to those of architectural design. Citizens must learn to analyze the best of educational practice and help translate that thinking into learning spaces or environments. Architects must move beyond predetermined square footage requirements and minimum building codes to examine developmental rights (across body, mind and spirit), subject matter disciplines, and the instructional delivery system as criteria for design. Schools must become true learning centers, three-dimensional textbooks celebrating the richness of the built, natural, and cultural environment. Leaders must encourage communication between all parties so that goals can be set and varying groups within a community are operating with one mind to produce unified results. Ideally, all communities should develop and implement high quality design and programming capabilities before one more school is built or one more curriculum adopted.

There is a sense of urgency to these tasks. School construction is big business and

enrollment is growing (Council for Educational Facility Planning [CEFPI], 2000). CEFPI, whose mission is to promote the development of educational facilities that provide the best possible learning environments, claims that $120 billion is needed for facilities to address health and safety issues alone. Enrollment is at a record 52.2 million K - 12 students, and each computer added to a classroom displaces 1. 5 students (CEFPI, 2000). Estimates are that $210 billion will be needed in America alone to retrofit and build much needed schools in both urban and rural areas. Districts will need to build 15 billion dollars' worth of schools each year as the enrollment increases by 1.6 million students in the next eight years (Pierce, 1999). This is an intensely active time in school construction, and yet schools are built or renovated every day without input from students. Architects design monuments to themselves instead of places to support learning and curriculum. Educators occupy environments and use equipment they don't fully understand and can't exploit to the fullest. Children learn to tune out the environment rather than to develop awareness and a sense of belonging. Now is the time for foresight, inclusion, and planning, not ten years from now.

Facilities needs are not the only concern. Many districts are facing increased demand for accountability, standardized measurement, and voucher programs and other over-simplified solutions to complex educational issues. Schools and communities must communicate with increasing precision and depth in order to meet these challenges. Gregory J. Cizek, in a recent *Phi Delta Kappan* article, suggests that educators and educational researchers need to break away from the crisis-reaction approach to education policy, and should focus instead on anticipation of future challenges and innovation (Cizek, 1999). Cizek suggests that policy solutions should take into account the complexities of the educational process, attitudes toward, and support for, education in the community as well as from parents, and motivation of students. Closely linked to the crisis mentality is the pendulum effect whereby educational reforms swing from one

extreme to the other, effectively outlined by Jeanette Throne in her article entitled, "Living with the Pendulum: The Complex World of Teaching" (Throne, 1994). As Throne states, either/or choices limit teacher effectiveness by preventing teachers and students from developing a more comprehensive view. Both Cizek and Throne have recognized that due to the complex nature of education, successfully addressing reform in schools means seeking balance and integrating multiple viewpoints. In restructuring learning environments, planners need to develop methods for identifying complex issues and must use design processes to synthesize approaches rather than focusing on dichotomies.

Restructuring schools does not mean pasting something on the top of existing curriculum or facilities (Orr, 1992, pp. 129, 138). As is illustrated in the several case studies cited later in this paper, restructuring means using research to design new patterns that function well *and* make use of what schools do best. What do schools do best? What are they designed for? They develop work that intellectually engages students according to the most compelling research available in order that those students may become well educated in the eyes of society (Schlechty, 1997).

The key implication behind this statement is that learning must be authentic. Students are telling us in ever increasing numbers, "Make our education real!" (Concordia, Inc. & Anne Taylor Associates, 1996). Learning must be relevant to students and to the life students will lead after graduation as citizens of a community. Design education answers the dual requirement that student work be intellectually engaging as well as useful to society. Not only does the design process require higher level thinking skills through interdisciplinarity, but design products must function or perform for people in the real world. The design process outlined below has real world value:

- Identify the problem

- Collect and analyze data
- Determine performance criteria
- Generate alternative solutions, build prototypes
- Evaluate and select appropriate solutions
- Implement solutions
- Evaluate outcomes (Davis, Hawley, McMullan & Silka, 1997).

Design education closes the gap between thinking and doing, while at the same time increasing the connections between schools and society. Communities and students benefit when the design process becomes a part of curriculum, when architectural programming needs are expressed in terms of student needs, and when students are involved in facilities planning and design.

The Scope of this Article

To provide discussion of the above issues, this article first will review an integrated model for addressing school design and curriculum, the School Zone design process. It will survey several recent innovative projects or case studies which show how implementing change at the school and community level works and what is happening right now in the areas of planning, design and school initiatives. These cases have been selected to illustrate the philosophical framework behind the School Zone model:

- All children can learn.
- The community must cultivate the image of children as strong and powerful thinkers (Edwards, Forman & Gandini, 1996).
- Students learn from the context of the built, natural and cultural environment.
- The environment is used as a three-dimensional textbook for teaching concepts (content) across all disciplines.

- Children learn by constructing their own knowledge through a variety of learning processes across body, mind and spirit.
- Spaces for learning should support hands-on exploration by functioning as studios rather than as traditional classrooms; and furniture and equipment systems must be modular, flexible, deployable, and easily manipulated by students.
- Designing is a creative problem-solving process involving teamwork and collaboration.
- Understanding integrated systems thinking and the Principles of Ecology is essential for all learners in today's world. This is described by David Orr as "education for sustainability" (1992, p. 137).

Following the case studies, this article examines four key issues or patterns extrapolated from the studies to show how involving children in the design process, both as a pedagogical model for learning and in the actual design of their own schools, has implications for the role schools play in the community. Patterns for reform using design criteria from multiple sources are outlined so that communities may take action to build and evaluate programs that synthesize community and educational needs. Research questions based on the patterns observed in the case studies are offered for further study. The focus in posing these suggestions and questions will continue to be on pragmatic implementation. Because implementation of the participatory process with respect to school design is in the early stages, most of the case studies have not been evaluated over the long term and can only be used to suggest evaluation procedures which arise naturally out of the projects themselves. Fortunately for future researchers, it is inherent in the structure of design education that evaluation is embedded in the process (Davis, et al., 1997). Design projects are relatively visible, accessible, and easily documented, and in some ways are more readily measured than curriculum based on abstractions. Finally, at the conclusion of this paper, an appendix offers additional topics for research.

The School Zone Institute Design Process:

A Model for Cooperative Endeavors

Professor Anne Taylor and architect George Vlastos founded the School Zone Institute in order to combine the curricular and child development goals of education with the design elements of architecture. The prime focus of the School Zone model is that the physical setting of the learning environment does make a difference in, and directly contributes to, a child's behavior and learning. The model expresses a system for learning: the context for learning, the content to be learned, and learning processes (see Table 1, below, for an overview). After these educational factors are identified and concepts are listed according to district requirements and standards, the information is then translated into design determinants that plot the course for every design decision made by the architect. In this way, the environment is designed as an active learning tool from the onset of the project (Taylor & Vlastos, 1983).

Table 1: Simplified Overview of the School Zone Model

Education		Architecture
Context	Systems thinking	The built, natural and
	Ecoliteracy	cultural environment
	Interdisciplinary Themes	is a 3 - D textbook
Content	Concepts	Design determinants are
	Integrated subject matter	based on curriculum content
	Standards and benchmarks	(e.g., courtyard design contains a working sundial)

Learning	Concrete to abstract skills	Programming and design
Processes	across body, mind, spirit	process addresses client
	Multiple intelligences Evaluation	and diverse ways of learning

The School Zone process not only serves in a programming capacity as outlined above. It also acts as a learning tool for students by clarifying architectural process and focusing awareness on the environment. Just as architects learn to view spaces in terms of educational goals, students learn to look to architecture and design as a source of knowledge and a way to study concepts across all subject matter areas. The architecture of a building, a doorway or an arch, for instance, can teach much about descriptive geometry while at the same time demonstrating principles of force, load, tension, and compression from physics. Geometry is used to read the building shape, while physics helps the student to understand its structural elements. Geometry and structure of the arch merge into artistic/aesthetic style as students construct arches, or into social studies as students learn about ancient Rome and the Aqueduct. Buildings begin to take on a wide range of associations and meanings for the occupant instead of remaining unnoticed, passive volumes of space.

A brief description of the components of the School Zone model follows.

Context

Context is the environment in which we learn. In educational terms, it is helpful to view context as Systems Thinking, Ecoliteracy and Interdisciplinarity. Schools cannot and should not be separated from the context of local community during both the programming and the design process.

Systems thinking means seeing the world in terms of connections, relationships, and

interdependencies. For educators this means moving from linear to non-linear thinking, from what to learn to how to learn, and from analyzing parts to synthesizing wholes. Classrooms become student-centered, flexible, project-based studios rather than teacher-centered, rigid grids modeled on factories. Systems thinking is integrated thinking across disciplines.

Ecological thinking is also systems oriented. We are physical beings who live in physical space, and, as such, we should be attuned to the rhythms of life on earth, or "ecoliterate." The Principles of Ecology as adapted from the work of author Fritjof Capra at the Center for Ecoliteracy, Berkeley, CA, form the basis for this understanding of place:

- Cycles — recycling of resources and partnership
- Networks — interdependence, diversity, complexity
- Development — succession and co-evolution
- Boundaries — scale and limits
- Flow-through — energy and resources
- Dynamic Balance — self organization, flexibility, stability and sustainability

(Capra, 1996 [also see Center for Ecoliteracy]).

Ecoliteracy means understanding the role of humans on this earth as a part of, not apart from, earth systems, and creating spaces that reflect an awareness of, and respect for, our surroundings.

Interdisciplinarity and theme-based education derive their structure from both systems thinking and ecoliteracy. Overarching themes like "change" or "patterns" or "systems" can be used to help students make connections across subject matter disciplines and to encourage in-depth learning (Kaplan & Gould, 1996).

Finally, an essential element of context is community. School Zone actively seeks community involvement and collaboration before new structures are built or old ones are

renovated. The programming ideas described here engage stakeholders in an elongated process of thinking about the total community as a learning environment. Facilitators from schools, school consultants, city planners, and/or architectural firms may all be called upon to initiate multiple strategies for data collection from the community. The process of data collection may follow these "user-friendly" steps for participatory planning:

- Participants relate stories about most potent learning experiences, both negative and positive.
- Participants analyze *where* they learn. They look into joint use and co-location of facilities in the community.
- Planning committees are formed. Stakeholders take a Myer-Briggs test to determine talents, strengths and interests, and to which committee they should be assigned.
- A logo is designed for the project in order to give all participants a visual symbol of the joint planning process and a collective visual image that represents group goals.
- Treasure cards are distributed to find out what the community assets are. These cards are questionnaires in both English and Spanish about local resources which can be filled out and returned to the school as a reference of community mentors, services, supplies, and businesses.
- Data is collected through student preference surveys, compiled, and presented to community members (work may be done by students)
- Study groups are formed to investigate communications, socioeconomic factors, government, educational criteria, and facilities infrastructure.
- Groups draw, dream, and articulate preferences and findings throughout the process.
- A draft of the recommendations is made and reviewed.
- A town hall meeting is held to get feedback on the final report and strategies for action on

the plan are devised (Bingler, 2000; Concordia, Inc., Architects & Anne Taylor Associates, 1996, 1998).

During and after a master plan is in place, School Zone continues to provide architecture and design workshops for adults and children in which learners investigate the built, natural, and cultural environment in order to fully appreciate the community in which they live. The context for learning includes not only the school and school grounds or the site to be developed, but extends into the community and beyond.

Content

Content is defined as what is to be learned, and is expressed in terms of integrated subject matter concepts, across disciplines. The importance of concepts is that they are universal and represent in ideational form the material world and our surroundings. Concepts are extracted from standards set by school districts or by national groups such as the American Association for the Advancement of Science, which promotes science literacy, including a benchmark or set of concept goals entitled, "The Designed World" (1993).

The following list of concepts (Table 2, below) is derived in part from California State Standards for grades K - 8 (State of California State Board of Education, 1999). It is not exhaustive, but can be used to link curriculum to design determinants by architects creating learning environments.

Table 2: Curriculum Concepts

Subject Matter Discipline	Concepts
Math	numbers, numerals, sets and logic, time and measurement, geometry, sequence, order, quantity, counting, data collection, estimation

Life Science	plants, animals, food web or chain, adaptation, interdependencies, cells, genetics, evolution, life cycles, anatomy, habitat
Physical Science	force, structure, motion, states of matter, light and color, electricity and magnetism, chemistry, machines, energy, refraction, reflection
Earth Science	land, air, water, weather, natural resources, astronomy, rocks and minerals, topology, wind, solar system, plate tectonics, earth history, recycling, geology, ecology
Social Studies	maps/globes, geography, cultures, race, consumption, scarcity, change, power, governments, diversity, nations, religions, trade/markets/economy, history, ancient civilizations, demographics, jobs and employment, values
Language Arts	print, phonemic awareness, word recognition, vocabulary, reading comprehension, genres, literary response, usage conventions (grammar, spelling), research, writing strategies, narrative, poetry, editing techniques, media, biography, word processing
Health	hygiene, nutrition, health care profession, safety, conflict resolution, growth and development, body systems, reproduction, sports, exercise and fitness
All Arts	artistic perception, creative expression, history and culture, symbolism,

	aesthetic valuing
Visual Arts	point, line, shape, form, color, texture, dimension, rhythm, contrast, unity, repetition, balance, harmony
Music	tone, melody, rhythm, value, harmony, scale, interval, tempo, physics of sound, composition, instruments
Dance	body awareness, rhythm/beat, patterns, pathways, choreography, costume, energy, force
Drama	direction, intonation, pitch, expression, delivery, phrasing, non verbal communication, speech, diction, theater, performance.

Once the school curriculum concepts are identified and a program is set, architects can begin the work of establishing design determinants or elements. Examples of design elements include floors, ceilings, walls, lighting, ambiance, color, graphics, storage, furniture, heating, hazards, windows, handicapped access, equipment, etc. Each architectural element is fully articulated for each activity setting, and an educational benefit is described for that element. For example, architects and educators working together might delineate how careful attention to signage selection for the school entryway and office area will benefit student vocabulary development, reading comprehension, graphics awareness, provide a sense of school identity, and emphasize multi-lingual learning. Large tables on wheels rather than individual desks in classrooms will provide deployable, horizontal working surfaces for student design projects. Tiling in the cafeteria might be designed to display mathematical patterns and sequences. Schools

that eliminate lockers can transform hallways into museums of cultural realia. The possibilities are endlessly rich.

Concepts also play another role in programming. They are used by architects as a basis for asking the client questions about space needs. As architects learn about educational content, students explore architectural concepts used for planning and for design. Students learn that programming concepts differ from design concepts. Programming is abstract and analytical and happens first, while design concepts are concrete, physical and architectural (Peña, 1987). Peña lists common programming concepts ranging from priority to hierarchy, character, density, grouping, energy conservation, access, function, orientation, safety, cost control, schedule, and safety. Such planning concepts, as well as physical, designed elements, usually fall into three categories: basic needs of health and safety, functional needs, and psychological and aesthetic needs (Preiser & Taylor, 1983).

Learning Processes

Learning processes are how we learn--by using multiple senses, moving, manipulating objects, observing, sorting and comparing, creative problem solving using our many intelligences, reflecting, documenting experiences, and valuing. The whole learner is reached across a continuum of body, mind, and spirit, as shown in Table 3.

Table 3: Developmental Rights Across Body, Mind and Spirit

The Whole Learner	Explores These Developmental Rights
Body	Multi-Sensory Perception
	Gross and Fine Motor Development:

Health and Wellness

Mind	Concept Development
	Labeling, Language and Literacy
	Communication
	Remembering and storing information
	Observing and recording
	Thinking and creative problem solving
	Using technology
	Interpreting
	Predicting
	Applying
	Understanding
	Documenting and reviewing
	Employing a problem-solving method of inquiry (design process, programming, or the five steps of the scientific method)
	Felt difficulty
	Hypothesis
	Data collection
	Analysis and synthesis
	Accept or reject hypothesis and begin again
	Understanding ecoliteracy
	Awareness of the Principles of Ecology
	Systems thinking

Spirit	Creative self expression
	Cultural pluralism
	Valuing and making critical aesthetic judgments
	Ecological valuing
	Self and social development.

Note. The above table is presented in linear form for purposes of clarity, however, learning across body, mind, and spirit occurs simultaneously, and different processes influence each other during the entire learning experience (The American Institute of Architects & School Zone Institute, 1987).

There is a parallel correspondence between the developmental rights of body, mind, and spirit described in Table 3, and the architect's concern with "habitability" or health and safety, function and tasks, and aesthetics. Physical needs are met by careful attention to safety and codes, for example, while psychological or spiritual/aesthetic needs might be answered by providing spaces for students to display their own work. Habitability is an indication of environmental quality as perceived by the occupants of buildings.

The goal of architectural design is to achieve habitability for the client, which means being finely tuned to the needs of the client. As part of the communication process between student or client needs and architects, the School Zone process uses a "Habitability Framework" to translate developmental rights of body, mind, and spirit into concrete architectural support systems. The framework is based on Maslow's hierarchy of needs, which defines a spectrum of needs ranging from the physiological to self actualization (Preiser & Taylor, 1983). This ensures that client needs are fully addressed in the architecture, and that the architecture becomes an active learning

tool.

In addition to the above developmental rights, architects, educators, and communities may study and appreciate diversity of learning processes through Howard Gardner's Theory of Multiple Intelligences (1983). Gardner has outlined several ways of learning or "intelligences" which can inform educators as to individual student needs and can also direct designers to create responsive environments which will stimulate learners of all kinds:

- verbal/linguistic
- logical/mathematical
- visual/spatial
- musical/rhythmic
- bodily/kinesthetic
- interpersonal
- intrapersonal
- naturalistic.

Architects translate the intelligences into different types of spaces for learning. For example, students need public, social gathering spaces for developing interpersonal skills and a sense of community, but at the same time they also need private, quiet places (intrapersonal) to reflect on learning. Knowledge of various learning processes helps architects expand the functionality of schools. This same checklist of developmental rights and multiple intelligences easily could help round out facility planning at the community level, also.

The School Zone Design Process is flexible and adaptable. It is important to enter into a cooperative effort with an open mind and a tolerance for ambiguity. The process offers both schools and architectural firms ways to examine curriculum, developmental rights, and the instructional delivery system before designing learning environments. Articulating programming

needs also provides a basis for evaluating a project after completion. As a model, School Zone methods demonstrate synthesis, integrated thinking, communication skills, and a deep respect for young learners who are participants in the design process. These attitudes are also reflected in case studies outlined next.

Summaries of Case Studies

Cornell students recently posed these questions following the Taylor workshop in the 2000 Stein and Schools Lecture Series:

- How might community and school planning be integrated?
- What does it take to work in an interdisciplinary manner?
- What areas in the school design process are ripe for collaboration?
- How do we educate our communities on the benefits of restructuring our school systems?

These are good questions with which to begin an investigation of the case studies. I have loosely grouped several design success stories into these categories:

- Collaboration and Participation
- Culture and Sense of Place
- Architecture and Design as Pedagogy
- Ecology and Design.

Good design draws from all of these areas, and there is some overlap between cases. The headings are simply chosen to focus thinking on the benefits of design education and the potential roles of school and community in planning.

Collaboration and Participation

Schools must satisfy students, the school system, parents, and community--and all these

groups have different wants and needs (Schlechty, 1997, pp. 140-148). Pleasing so many "markets" means defining the customer or client and collecting data and input from all stakeholders before you design the product.

Case Study # 1: Trout Lake, Washington

In Trout Lake, the district had been trying to pass a bond issue for five years. Both parents and children wanted a community center with a child care facility, gymnasium, auditorium, a library connected electronically to the statewide system, and a nutrition and cooking lab for community classes. The superintendent and architect honored their wishes. Teachers, parents, and students were trained in design and communication through workshops in drawing, design and model-building. They were involved every step of the way in research, programming, site analysis, and environmental impact studies (students found black water from the septic tank on their playground). Forest Service employees helped students conduct soil conservation experiments. One month after a student architectural exhibition and parent meeting, the bond issue passed. It also passed at the highest possible tax rate in Washington state (School Zone Institute & Taylor, 1992).

Case Study # 2: Stockton, California

A community school will become a farm and environmental study center as part of an alternative high school, based on student input and unique design ideas from students during the programming process. These students said over and over, "Make our education REAL!" Their input as stakeholders in a one-year programming process changed the course and design of the new high school. Students performed a site analysis for the architect, who then put it together as a professional document.

Professionals from the community were viably involved in several ways. A business incubation section of the school was planned so that students could start their own businesses. A health club owner planned to build a spa and swimming pool on the school grounds, to be used by the students during the day and by the community at night and on weekends. Engineering, traffic, and landscape consultants hired to participate in the project were asked to spend time envisioning how their designs could be so built that they would become learning tools as well as functioning aspects of the environment. They had never been asked to do this before, but soon ideas flowed. The HVAC system was to become a museum of mechanics and physics. The playground developed into a learning landscape, much of it cared for by students, complete with sundials, windmills, wind channel walls for studying air currents and flight, multicultural entryways and flags, greenhouse, aqua culture ponds, and more (Wolff Lang Christopher, Architects; Bingler with Concordia, Inc., Architects; Sherk; & Taylor, 1994). A film, "They Really Listen to Us," dramatically illustrates the impact inclusion in the planning process has on student attitude and motivation toward learning (Lincoln Unified School District, 1994).

Note: the tax base was reduced when development fell through, and the district was unable to build the alternative high school. The district held on to the property, however, which will now become a middle school. The vision of an environmental center for learning will be realized, even after several setbacks in planning. This is a long-term process, but the design education and democratic learning did not go to waste.

Case Study #3: Western Placer, California

Lincoln is a small rural town near Sacramento surrounded on all sides by vast ranch lands. Large manufacturers such as Herman Miller, Zytec, Hewlett Packard, and others are beginning to build factories in the area. The Western Placer School District, which serves Lincoln schools,

needed to develop planning goals and a vision for future development in the light of recent growth. Concordia, Inc., an architectural firm based in New Orleans, worked with the district to establish PROJECT BUILD. The purpose of the project was to assist the district in the development of a community-based vision or Master Plan for the programming and design of educational facilities. This was accomplished by studying the context of the total community environment before developing a plan to guide decisions made by the district. Concordia and the district collected and analyzed data about rich community resources and utilized community participation in the architectural programming process.

For ten months, a group of teachers, students, business people and interested citizens met at Lincoln High School to examine four frameworks as a basis for collecting information about potential educational resources in the area. These frameworks included:

- Physical Resources -- What are they in this community?
- Learning -- What are our curriculum-content and instructional delivery system goals?
- Governance -- What is the city government and how can it be utilized in education?
- Socioeconomic Opportunities -- What social and economic institutions are there, and how can they be used?

During the planning process, participants were involved in a wide range of activities to build knowledge of place:

- Exploring architectural design and developing visual and spatial skills for better communication with architects who would be designing Lincoln's new schools. This means developing a "tool box" of architectural drawing conventions (bubble diagrams to show spatial orientation, plan views, elevation views, etc.) in order to represent ideas and concepts visually.
- Visiting and exploring the school district's 200-acre farm as an expanded learning site for

all students, not just for some dozen students in a 4 - H program.

- Listening and learning from distinguished guests who spoke to the committee about curriculum instruction, social programs, economic development, and governance in the community and school district.
- Visiting a Herman Miller factory to experience a production line and discover skills needed by workers in industry (students included)
- Taking an architectural walking tour of downtown Lincoln, discovering the historic architecture and evolution of the town and how the community could be used to study math, science, art and history. Information gathered was used to write a local guidebook illustrated with photographs.
- Utilizing a "Treasure Card" survey form to conduct interviews, collect and interpret data, and then to make presentations to the larger group about community resources. Treasure Cards when compiled make up a field of contacts, potential learning activities, and other ways for involving community in school operations. This work was done by students, who learned some incredible visual-verbal skills while presenting the material. Some true treasures were uncovered through this process, including a gift of three hundred acres given to the school district to be planted by the students as a mandarin orange grove. It was estimated that the school could reap over $400,000 annually when the trees mature.

Presently, Western Placer citizens have formed a non-profit corporation to enable long-term implementation of the Master Plan. It is estimated that the district saved $19 million through the planning process involving businesses when Zytec funded building of a new high school next to their facility (Concordia, Inc., Architects & Anne Taylor Associates, 1996).

Case Study #4: Hayward, California

In Hayward, a one hundred-person stakeholder group used a programming process similar to the above case study to conceive a master plan for the school district. The focus shifted from merely designing a new school to creating a community learning center, academy, and museum setting devoted to the arts and to multicultural study. In addition to its formal educational function, current plans call for the new facility to serve as a tourism attraction for the entire Bay Area, and as a national center for research in multiculturalism. An innovative integrated curriculum will be the focus of the academy's program, with extensions to serve all of the community's existing educational sites (Concordia, Inc., Architects & Anne Taylor Associates, 1998).

Case Study #5: Albuquerque, New Mexico
Rio Grande Education Collaborative Project Proposal

The University of New Mexico's (UNM) Institute for Environmental Education (IEE), a part of the School of Architecture and Planning, is taking the lead in this initiative, which brings together:

- The Albuquerque Public Schools (APS)
- Albuquerque Technical Vocational Institute
- IEE and UNM
- Community members -- from both business and non-profit organizations, as well as local families.

The goal of this project is to provide post-secondary and Rio Grande High School Cluster students with an opportunity to learn through experience and mentorship. This will be attained through the design and construction of an innovative learning facility on the high school campus, achieved primarily by students. During the design process, students will work with post-

secondary students and professionals in various fields (i.e., architects, engineers, contractors, lawyers). The perceived benefits are:

- Curriculum reform will take place at K - 12 and post-secondary levels
- UNM students as well as the APS community will directly benefit through involvement in design, programming, construction and, ultimately, through occupation of the facility.
- Area residents will have a facility for continuing education and vocational training supported by both educational institutions and business
- Other school districts and communities will learn from this model for interdisciplinary and enhanced learning.

It is anticipated that developing a true community center will take about five years. The collaborative will break new ground in developing relationships that have not existed before. The work is comprehensive, creative, and complicated. There are no illusions that this will be an easy undertaking, but this project has the potential for lasting positive impact which can be replicated throughout the educational community. Several methods will be used during the course of the project to achieve the benefits to the community listed above:

- IEE will work to develop strategic alliances. A steering committee with members from all partners and from local businesses including Public Service Co. of NM, Sandia National Labs, and Intel, as well as non-profit organizations like the Governor's Business Executives for Education, has already been established.
- IEE will provide real-world educational experiences. These experiences are available through design studios at the university in both architecture and engineering departments, after school academic programs at a local middle school, and teacher professional development training.
- The partnership will work to increase levels of involvement and leadership. The number

of post-secondary students will increase through interaction between secondary and post-secondary students and facilities. Service learning, mentorship, and internships all contribute to this effort.

- This project will show relevancy in education as a vehicle for future success. By implementing innovative learning styles and strategies, along with a constant stream of role models, it is hoped that the initiative will reduce the Rio Grande Cluster's drop-out rate of nearly 38%.
- The program will develop student visual and spatial thinking skills through applied learning techniques.
- The collaborative encourages the use of innovative educational theory and ideas in practice. This is achieved through experiential learning, project longevity, real life issues, favorable public exposure for educational institutions, team environments and cross-disciplinary collaboration, and applied learning (Institute for Environmental Education [IEE], 2000).

Note: Any one of the variables described in the design process could form the basis for qualitative academic research on the success (or lack thereof) of this collaborative approach.

Case Study #6: Intel and Rio Rancho, New Mexico

Intel, computer chip-making giant, financed building of a new $30 million high school in return for industrial bond tax breaks in Rio Rancho, NM, a city northwest of Albuquerque. Similar tax incentives to attract and hold industrial and business development have been used by cities for years, but in this case the city has a new high school to show for it. Business has an interest in high quality schools, and schools in growing districts need financing. Used with a little creativity, mechanisms exist in city planning to bring these two groups closer together for their

mutual benefit and the benefit of the community as well.

In addition, graduate students from UNM offered a design education program at the new high school in which students used Intel technology to design houses of the future. Their work was exhibited at UNM's School of Architecture this year.

Culture and Sense of Place

Schools can reinforce and extend our understanding of place so that we better understand ourselves and our communities.

Case Study #7: Los Angeles, California

The Metropolitan Forum Project, headed by journalist and civic leader David Abel, has created "New Schools/Better Neighborhoods" (NSBN), a project addressing the gap between research about the negative affects of large schools on learning and behavior (see Barker & Gump, 1964; Fowler, 1992; Garbarino, 1980; and Glass, 1982) and actual building practices which often result in schools of 3000-plus students.

NSBN links smart growth with smart schools. There is a need to create small, high quality, community-centered schools where there will be less need for busing, shorter commutes for parents who might otherwise move to the suburbs, and shared community space in which adults and children can mix, share ideas, and learn together. NSBN's answer to traditional bureaucratic methods of school site selection is to move from rigid preset formulas to soliciting community input during site selection and design. The goal, says Abel, is to create schools as centers of communities and communities as centers of learning (Abel, 1999; New Schools Better Neighborhoods, 2000).

Case Study #8: Los Angeles, California

Architect Steven Bingler, Concordia, Inc., has been working with the Los Angeles School System to design smaller schools on sites in older, dense neighborhoods where large sites are hard to find. Often these sites are toxic brown fields, wasted spaces as they now stand. Part of the charge is to explore collaborative efforts and to consider joint development of not only the schools, but parks, libraries and public services (Bingler, 2000).

Case Study #9: Downtown Montgomery, Alabama

A judge, an architectural firm, educational consultants, and business people formed a partnership to design a state-of-the-art daycare center as part of downtown revitalization and in response to a perceived need for high standards in early childhood care. Plans exist for the site to be used in family education, also. As it happened, the site of the facility was located near train tracks. The rumble of the train and the sound of its whistle as it approached a crossing was a distraction that soon became an inspiration, however, and resulted in curriculum development based on the real world setting of the school and the interests of children. Curriculum design called for thematic units based on trains, the nearby river, Martin Luther King, Jr. (whose church is just a few miles away), and other features of the local community. Sense of place can be used to develop curriculum that is of immediate relevance to students, no matter how young. School sites and aesthetically pleasing designs can revitalize neighborhoods (Concordia, Inc., Architects, & Concordia Consultants Enggass & Taylor, 1999).

Case Study #9: Inner City Philadelphia, Pennsylvania

Schools can also be places used to explore inequity and change views of social structure at no great expense.

Paul Skilton Sylvester, a third grade teacher in Philadelphia, created a classroom economy with the help of his students. In-depth study reflected serious, real life concerns of the inner city neighborhood, from homelessness and unemployment to unfair labor practices, as well as solutions to these problems. The neighborhood environment and student responses to that environment informed the curriculum and the course of study. Bit by bit through the course of the school year, third grade students designed an entire social structure, a functional neighborhood in the classroom, adding structures, jobs, social institutions, and complexity as issues arose, while Sylvester acted as a facilitator and problem-seeker. Students constructed a complex community which allowed them to design new, powerful roles for themselves while practicing academic skills.

Sylvester has written a fascinating account of this experience in urban transformation--how curriculum must not merely replicate society and its inequities but can act as catalyst for change and generate meaning for the community (1994). The article appears in the *Harvard Educational Review*, "Improving Schools from Within, Creating Successful Classrooms."

Case Study # 10: Santa Clara Pueblo, New Mexico

Schools may reflect community through art, design, and craftsmanship.

Students and architects at Santa Clara Pueblo, NM, designed a playhouse for local children using authentic adobe construction techniques, local historical architectural style (Pueblo style architecture), and incorporating stones from an ancient dwelling (Taylor & Vlastos, 1983). During the process students learned to appreciate the history of their culture through architecture and design, while at the same time working to preserve and perpetuate their heritage by using authentic tools and methods as well as materials with cultural significance. Too much of our school architecture is generic, with little character or reflection of place or culture. It's not

necessary for a school in New Mexico to look the same as one in Wisconsin.

Architecture and Design as Pedagogy

Architecture teaches students awareness of place. As students engage in the study of design, they follow a problem-solving process outlined earlier in the discussion of the School Zone design process.

Case Study #11: Architecture and Children Program, University of New Mexico Institute for Environmental Education Anne Taylor, Director

The Architecture and Children program uses the built environment as a window to study the world and the ideas, laws, and principles that govern it. It is most significantly concerned with the integration of academic and artistic disciplines and the interdependency of all things on the planet. Human beings are a part of, and not apart from, their environment. The curriculum in poster form (The American Institute of Architects [AIA] & School Zone Institute, 1987) and accompanying teacher guide (Marshall, Taylor & Vlastos, 1991) employ design methods to explore concepts across subject matter disciplines now already taught in the schools. Students solve architectural problems and learn to think three-dimensionally while exploring physics of structure, design in nature, comparing body systems and building systems in architecture, visual vocabulary and communication, and more. The design system becomes a format for curriculum development in which problems are posed in terms of architectural program, client needs, visual problem-solving techniques, presentation, and evaluation.

Architecture and Children is taught each year in summer design academies for children and teachers, through collaboration between graduate students and the public schools, and through IEE consultant work across the nation and in Japan. This spring, student architecture studies

culminated in a trip to Japan in which students from New Mexico elementary schools, taught by UNM graduate architecture students, visited their designer counterparts in Sendai, to compare their designs for ecologically friendly, sustainable architecture of the future (Anne Taylor Associates, 2000).

Case Study #12: Brookside Project, California

Architectural practices can be converted into school curriculum to promote understanding of place.

Brookside School students, teachers, architects, and design education consultants teamed up to adapt American Institute of Architects (AIA) guidelines for site analysis into curriculum experiences for elementary school students. Site analysis workbooks with age-appropriate activities were created for classroom and outdoor use (Concordia, Inc., Architects; Anne Taylor Associates; Wolff Lang Christopher, Architects (1994). Copies of the actual AIA guidelines were included in these guides for in-depth background, and to show in more detail why each aspect of the site must be examined during the planning process. Students created basic site plan maps to explore the physical, cultural, and regulatory factors involved in evaluating a potential school site. Projects explored climate, topography and soils, water flow, history, vegetation, and wildlife. Student input and data collected from these projects was depicted on the maps and used as a starting point for working with architects at every stage of architectural design for a new school:

- site analysis
- programming
- master planning
- schematic design

- design development
- construction documents
- construction administration
- post-occupancy evaluation (POE).

By the time they were through, students thoroughly understood the school and its grounds and developed a strong sense of place (Concordia, Inc., Architects, et al., 1994).

Case Study #13: San Diego, CA, and Albuquerque, NM

Technology is changing school design. San Diego-based Creative Learning Systems (CLS) designed SmartLab™, a responsive instructional environment for the study of science and technology that goes well beyond the usual computer lab to give students access to, and control of, applications and information in areas such as:

- Robotics
- Computer-aided manufacturing
- Systems simulations
- Satellite technology
- Pneumatic structures
- Rocketry
- Aerodynamic Testing
- Simulated flight
- Hydroponics
- Superconductivity
- Space-frame construction
- Computer-assisted publishing.

CLS teamed with consultant Anne Taylor and architect George Vlastos to design "Cybervillage," a middle school curriculum offering movable, deployable furniture systems and an ecologically sound vision for learning to enhance the technology lab setting (Taylor & Vlastos, with Creative Learning Systems, (1998).

Ecology and Design

The Principles of Ecology outlined earlier form a context for learning as well as a manner of viewing the universe. For example, several community-sponsored programs using gardening as a teaching tool have been introduced in recent years. School recycling programs abound. Schools are public buildings that usually receive the typical functional landscaping designs of such facilities, designs that view playgrounds only in terms of recess . Going beyond these efforts means developing school grounds into academic support areas, or learning landscapes.

Case Study # 14: East Haven, Connecticut

School Zone Institute and Anne Taylor Associates have collaborated with school districts at several locations to increase the academic usefulness as well as the beauty of school grounds by infusing the knowledge of landscape developers with curriculum goals, and redesigning school grounds based on input from students and community. Landscape design provides a synthesis of architectural, educational, and ecological learning opportunities that have been often overlooked in planning school grounds.

Students and staff at East Haven schools worked with landscape architects, community experts, and science curriculum resource administrators to transform playgrounds into "learning landscapes," or carefully designed spaces for outdoor learning. These spaces not only offer learning opportunities and community gathering places outdoors, but also support the school's

indoor curriculum and district content standards.

At East Haven schools, students learned architectural schematic drawing techniques in order to communicate visually with landscape planners and to conduct site analyses of the neighborhood and school grounds. In the process of becoming more aware of their environment, students also participated in clean-up of a local stream and other stewardship and aesthetic improvements to the area. Albuquerque science resource teacher Terry Dunbar designed learning experiences based on solid science investigation and inquiry using the habitat and physical characteristics of the existing site to study biology, physics and earth science. Architecture and Children curriculum (AIA & School Zone Institute, 1987) provided corresponding landscape design and construction experiences using the environment as a catalyst for learning. Students not only analyzed existing environments, but extended their thinking into dreams for the future. Landscape architects took student findings and drew up site plans to be used as visionary master plans for implementation over time (Taylor, Dunbar, Patel & Lange, 1998). This same process--moving from awareness to collecting data to taking action--has been repeated at several schools in California and New Mexico, and is being developed in guidebook form (Class, Enggass, Martin & Taylor, 2000; Sanger Unified School District & Anne Taylor Associates, 2000a).

Case Study #15: Sanger, California
Quail Lake Environmental Charter School and Others

School Superintendents can take a proactive role in bringing research into the classroom. Communities learn from living examples of the theories at work, and schools become showcases for good planning and design.

Dr. Denise Hexom, Superintendent of Schools, Sanger Unified School District, has taken extensive reading in education research a step further by inviting collaboration with education researchers. She brings diverse thinkers together, sets up teams for cutting edge learning, and then

supports those learning efforts at all levels through coaching and mentorship. The district faces low test scores, changing demographics, and increasing community demands for standards based testing and accountability. Hexom is helping to meet that demand in multiple ways by adopting clear-cut scripted reading (Open Court) and math block scheduling, while at the same time using charter schools to explore:

- options in learning landscape design and visual design education (Sanger Unified School District & Taylor, 2000a and 2000b),
- applications of Sternberg's Triarchic Theory, which offers a definition of successful intelligence based on three interacting yet distinct aspects: analytical, creative, and practical thinking (Sternberg, 1985 and 1998)
- Principles of Ecology and systems thinking as defined through ecological issues in local development and through interdisciplinary themes (Kaplan & Gould, 1996).

Hexom has forged strong community connections through the local developer of a new neighborhood at Quail Lake. The development of the charter school to be located in the neighborhood is parallel to and reflects the primary features of the development at Quail Lake. Quail Lake is unique in that it is also part of a national program to preserve wetland areas within the boundaries of the neighborhood, and the environmental emphasis of the charter school reflects that unique community identity and ecological focus.

Students and staff at Quail Lake Environmental Charter School are excited to be a part of (not apart from) the school design process from the beginning. Students are occupying temporary portable classrooms on site while the school is being built beginning this year. This is a unique opportunity for all stakeholders to witness and participate in the development of the school property. The Architecture and Children program (AIA & School Zone Institute, 1987; Marshall, et al., 1991) is providing design workshops which will enable students and faculty

alike to communicate effectively in the language of design and to provide not just opinions but informed suggestions for school and classroom arrangements that support district standards and authentic learning. While the school is under construction, teachers and students will experiment with the design of their portable classroom spaces and the use of deployable furniture, will investigate and analyze school grounds for educational potential, and will use technology (digital cameras, word processing, and multi-media processing programs similar to hyper card™) to document the entire process of designing a school. Anne Taylor Associates is writing curriculum with student, teacher, and administrator input based on the process of development and design of the new school. The Quail Lake project is a model which addresses new development and community growth issues by bringing the client and the developer together through sound educational practice and research (Sanger Unified School District & Taylor, 2000a and 2000b).

Case Study #16: Oberlin College, Ohio

School buildings should be teaching many lessons of conservation and ecoliteracy, or the understanding of ecological systems and the natural world. They should be habitats for a variety of living creatures, producing oxygen, purifying waste water, nurturing ecosystems, and turning sunlight into energy.

One such building is the Adam Joseph Lewis Center for Environmental Studies at Oberlin College. The building and landscape are designed to show their construction, and to demonstrate how they function. The 13,500-square-foot complex includes a two-story rectangular building with classrooms and offices and a small structure housing an auditorium and a "living machine" that filters the building's waste water through a series of marsh-like ecosystems. The water from the process is harvested and recirculated for use in toilet tanks. The main building's north wall is insulated by an earth berm planted with fruit trees, while a pond and wetlands filter storm water

runoff channeled by a grassy swale. A meadow and small woodland recreate the landscape that existed before European settlement. Because of the way the building is oriented, and due to low windows facing south, the building's energy consumption is only 21% of the national average, according to David Orr, its director (McDonough, 1999).

Basic Patterns for Reform Revealed Through a Review of Case Studies

The case studies reviewed here share a common perspective in that they begin with or within school systems and end with real benefits to the community at large. This section will shift attention to more directly address the operating thesis or value statement of the Stein and Schools Lecture Series, of which this paper is a part, "In order to significantly affect community development in the 21st century, communities must advance their ability to cooperatively join their community development and educational planning, through new policy, design, and planning initiatives."

In other words, how can schools and communities work together to develop the best places for living and working?

In addition to the optimism one should feel in reviewing the case studies, citizens and researchers can also extract from the case studies certain guideposts for taking action to design better schools. Four observations gleaned from the case studies are presented here, along with suggestions for ways communities can take action and possible avenues for further research.

Observation #1:

Communities must design ways to identify and include all "clients" during the programming and design process of centers for learning.

Success in the case studies depended on broad-based community input, and a programming attitude that proclaimed, what the client has to say matters. Apathy is only one of the negative responses to exclusion.

Suggestions for Community Action:

- Consult the people who will be or are using the building. Do this early on during the planning process. Follow the School Zone model to get started.
- Design civics curriculum that uses field trips to community meetings, planning boards, architectural firms, city planning offices, etc.
- Hold community meetings at schools.
- Broaden your client base by sharing and collecting data on changing demographics (our population is getting older, for example) and combining parent/student requirements with after hours programs that matter to different local groups. Note: this does not necessarily mean that school personnel will take on more community responsibilities. We are talking about optimizing the use of space and saving money for taxpayers.
- The Council of Educational Facility Planners International (CEFPI) offers training and certification programs to encourage better construction practices for schools through advocacy, training, and research. The organization offers a designation for "Recognized Educational Facility Professional" for the facility planning profession (CEFPI, 2000). These and other groups can help communities develop standards and awareness.

Suggestions for Research:

- Collect data from multiple groups to evaluate school performance. In New Mexico, the Coalition for Science and Math Education (CESE), a private nonprofit organization, contributes a different perspective on education by beginning with questions and seeking data before drawing conclusions. CESE observations are scientific conclusions drawn

only from the actual data, not opinions or recommendations. CESE's initial findings have indicated where schools need improvement and where further study is warranted. Findings are reported to the State Board of Education and State Board of Education at no cost to the state (Brügge, Johnson, 2000).

- There is still a need for more qualitative research which shows the effects of more community and client involvement in the learning process as well as in the design of the learning environments which house them. Lorraine Maxwell, Ph.D., of Cornell University, recently completed a study, "School Building Renovation and Student Performance: One District's Experience." In the Syracuse city study, elementary school student test scores were evaluated before, during, and after a district-wide renovation effort. Results revealed a statistically significant relationship between upgraded facilities and higher math scores, among other findings (Maxwell, with CEFPI, 1999). CEFPI acts as a collection and dissemination point for educational facilities research by partnering with planners, architects, educators, construction professionals, government, and higher education through its "Where Children Learn" program (CEFPI, 2000). Similar follow-up studies could be done on new schools designed as three-dimensional textbooks or tools for learning, as recommended here.

Observation #2:

Community members must develop visual-spatial and design literacy in order to participate intelligently while making contributions to any programming and design process.

It is essential that all parties communicate using a common language, and that those who are unaware of, or intimidated by, design principles and techniques will rarely give full support to

initiatives to restructure schools. Citizens must learn through the design process to defer gratification, to persist by revising work until functional solutions are achieved, to work in teams, and to take their victories where they can find them. If you lack the tools to think "out of the box," then all you will create is more boxes.

Suggestions for Community Action:

- Admit it: we live in a designed environment and we are a visual society. We need to be visually literate in order to sort through the volumes of information thrown at us through packaging, products, the media, and the Internet. Teach design to everyone, hold workshops, display school design work in public venues, emphasize a design component at science fairs, stage exhibitions and inventor shows, dissect advertising, evaluate your budget for public art, evaluate your community using design criteria.
- Involve more design professionals or graduate students in the classroom. They can teach visual-spatial concepts as part of teacher professional development as well as to students.
- Clarify the image of design as it is linked to art. Imaginative design thinking is not limited to a few geniuses who are lucky to be born talented. Everyone is a designer. Add this to a city motto. Send this message home with the design work students do in school.
- Schools and communities must communicate with well designed materials. Buy, use, and share technology to produce professional looking documents and displays. Advertise.
- Use a design programming method to define what you want to accomplish as a community. Designing within limits promotes creativity and integrates thinking. Time and time again, educators as well as architects and city planners witness the power of the clearly defined problem to inspire good thinking practices. In each of the case studies, planners and initiators faced the usual challenges: budget restraints, defining needs, lack of time, and upholding aesthetic standards. There is no way to meet all of these real

challenges without demonstrating flexibility and imagination.

Suggestions for Research:

- Use standardized test scores to compare schools with and without design education curriculum over several years.
- Design a design rubric and test it in the classroom. Architecture and Children evaluates student performance across five levels of achievement and five areas of expertise: Fluency and Clarity of Communication; Technical Competence; Understanding Process; Imagination, Innovation and Creativity; Detail and Overall Aesthetics (Sanger Unified School District & Anne Taylor Associates, 2000b).

Observation #3:

Communities must cultivate the image of young people as strong and capable learners who want to learn.

All of the architects and educators working on these projects believed in their students and trusted them to contribute effectively to the planning and design process. Educators relinquished some traditional controls and became facilitators in order to bring out individual and collective student strengths. Students responded beyond expectations to this challenge.

Suggestions for Community Action:

- Challenge students to fix a community problem or to maintain and enhance school property. Put young people in charge of a community initiative.
- Make it a policy that students be represented in city government.
- Use high school students who are technically literate to train teachers to get up to speed, to install technology, etc. Use students to teach seniors computer skills.
- Set up or take advantage of programs that invite students into the private sector as

visitors, performers, and/or interns.

- Students set up a web site for collecting design determinant data about youth and schools. Architects and others use this data to inform themselves about the needs of young people in terms of school design and community design.

Suggestions for Research:

- Use technology and scientific methods to gather information about students and what they want and need from school.
- Explore project-based learning and student-designed curriculum in terms of test scores. Do students at schools that employ these methods do better or worse than traditional schools? Do test scores measure design capability?
- Do research on alternative and technological processes and products that can be utilized in learning environments (e.g., laptops, new office systems, data collection devices for science).

Observation #4:

Planning and design techniques used by architects and educators can offer a model for communities to use in developing and evaluating initiatives.

The "how" of most of the success stories is linked to the synthesis of existing procedures and concepts. Participants in the case studies built on what they knew in order to create something new--new planning processes.

Suggestions for Community Action:

- Schools as well as communities benefit from sharing spaces and developing locations to suit multiple needs. Determine habitability concerns for the groups that will use the space. Where do needs overlap and where are they distinct? Synthesize these needs to

invent spaces that serve more than one purpose and save money. This process can also be used in a more abstract way to design communication processes and procedures for avoiding duplication of effort or information. For example, schools already offer minimal nursing and counseling services. If more extensive community services move into school locations, how might we ensure that (a) community resources save schools time and money and vice versa, (b) we develop communication procedures that we can use to gain a more complete picture of the whole child in the context of community, and (c) scheduling and functional "territory" are well defined?

- Adapt architectural evaluation procedures as methods for assessing community centers. Modify Post-Occupancy Evaluation (POE) criteria that architects use to evaluate buildings to fit your specific desired outcomes, such as streamlined management of shared spaces. POEs offer a systematic "before and after" methodology for analyzing spaces. Did the design do what the program said it would do? Is the space being used as it was intended to be used? For a start on learning more about POEs contact your local AIA organization, architectural programs at your local university, the Educational Design Institute, or use the Internet to connect with Design Share (2000) and its "School Construction News" feature on line. Once you develop your own version of habitability and its assessment, share it with architects.
- Familiarize yourself with architectural design standards. A listing of awards criteria for schools as centers of community has been developed through collaborative efforts of architects, consultants, educators, and CEFPI, through a United States Department of Education (1998) Symposium on School Design. To summarize, schools should:
  - Enhance teaching and learning and accommodate the needs of all learners
  - Serve as centers of community

- Result from a planning/design process involving all stakeholders
- Provide for health, safety and security
- Make effective use of all available resources
- Allow for flexibility and adaptability of changing needs (Design Share, 2000; United States Department of Education, 1998).

Suggestions for Research:

- As related to the above design awards criteria, this year Design Share and other jury members exchanged ideas about the process of soliciting and evaluating school designs from the design community. During this e-mail discussion it was suggested by Jeffery Lackney, Director of the Educational Design Institute, that jurors consider a way to require joint submissions from both the educator and the architect, similar to some published qualitative research that contains multiple perspectives (J. Lackney, personal correspondence, 8/1/2000). Further research along these lines might include analysis of school sites using multiple voices as compared to research findings of a quantitative nature.

Conclusion

Moving into the future means entering uncharted territory or, perhaps, territory that has been mapped out from high above by some sort of intellectual satellite, but has never been traversed by people on the ground. Out on the front lines, schools and communities are struggling to synthesize space needs, design, and usage on the most basic levels, relying primarily on building codes, predetermined square footage needs, and regulations, with little other input of an academic or aesthetic nature. Most often no one has considered asking for direct meaningful student input when planning new or renovated school buildings. This would not happen in the

business world, where the customer must be considered, at least, before being manipulated by marketing techniques. Valuable school space often rests unused during evenings and in summer months, and playground design rarely addresses academic curriculum (Sanger Unified School District & Anne Taylor Associates, 2000a). Designers of schools need to look deeper for inspiration. The instructional delivery system of schools is changing, and past models do not reflect the impact of technology and the information highway on the use of space in schools by both teachers and students, let alone community. In fact, classrooms as we know them today may be eliminated entirely in the future. At the very least they must be configured differently now that roles are changing. No longer should we see isolated classrooms located along double-loaded corridors, or individual desks arranged in rows, with classroom dynamics focused on the teacher as the center of knowledge--and yet this type of outmoded design is what we encounter in reality every day even as new, "cutting edge" schools are being built.

Artificial divisions between schools and the real world must be dissolved and replaced with holistic systems thinking, rather than territorial and hierarchical approaches to policy-making. In the case studies, teamwork during the design process arose from an awareness of the Principles of Ecology as guidelines for understanding our place in the universe. Communities of the future, if they are to survive as the building blocks of society, must define themselves as desirable places to inhabit. They must follow the laws of nature, which are not linear or fragmented, but cyclical and dynamically balanced.

Schools must find ways to communicate not only their needs but their successes and their research to the community at large. Community planners and architects, in turn, must try to familiarize themselves with research in the field of education. Current brain research shows us that humans learn by constructing knowledge, and that education focusing on rote memorization neglects the potential of far more powerful natural or "locale" memory systems which allow us

to remember complex detail embedded in context (Caine and Caine, 1991). Humans most naturally think by making connections to what they already know and by interacting with the spaces they inhabit. If more people were aware of this research, perhaps these same citizens would realize that standardized testing can only offer a partial measurement of what has been learned. In addition to brain research, nearly one hundred years ago John Dewey (1916) cited the importance of hands-on, minds-on learning, a constructivist theme now taken up by cutting edge magazines from *Educational Leadership* (November, 1999) to *Fast Company* (June, 2000). Furthermore, books abound about the current revolution in technology and how aware young people are of this revolution. As Tapscott points out in his books and articles about the rise of the net generation, our children often know more about technology than we adults do, leading to a "generation lap" in which students surpass teachers or authority figures in knowledge (Tapscott, 1998).

Research, the case studies in this article, and common sense are telling communities the same thing: that students construct meaning and learn within the context of the environment--the built, natural and cultural environment--and not in isolation. Schools cannot be viewed as separate from community. The education system is complex and cannot be fixed in piecemeal fashion.

Communities and leaders must ask themselves, why aren't we using what we know to create better schools and better facilities? Why don't we teach teachers and other citizens about the context of the environment and spatial understanding? Why aren't we using design--hands-on, problem-solving design workshops--to teach both adults and children how the world works? If young people know more than we do about technology, why don't we consult them and ask them to lead us into the 21st century? If we are preparing young people to become valuable contributors to society, why are we shutting them into stripped landscapes behind chain link

fences, cut off from interaction with community?

All stakeholders in the schools should be a part of the programming process of schools and curriculum. This is, at heart, what democracy is about: participation of an educated public in the process of governance. If, as the premise of this lecture series states, "...communities must advance their ability to cooperatively join their community development and educational planning," then that public at the grass roots level must gain some ability to think as designers and planners, to develop problem-solving strategies and a "knowing eye." Communities must develop an appreciation for the complexity of design work. Schools, first of all, must teach design, not only to K - 12 students, but to teachers and to others in the community as well. Before more schools are built, communities must initiate a programming and planning process that operates within the context of local concerns, that synthesizes thinking from multiple sources, that demands excellence, and that results in well designed spaces serving as visible expressions of community sensibility and culture.

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Appendix

RESEARCH QUESTIONS FOR THE FUTURE

It should be immediately apparent from the numerous cases outlined in this paper that planning for school facilities in the future cannot exist without community input and support. We should add to this mix that universities and colleges must also provide research and course work in the area of public school design. Students in architecture and planning programs need to understand educational goals and early childhood. The reverse is true as well. Those wishing to become teachers must learn how to express themselves visually and must become sensitive to the impact of the built, natural, and cultural environment on learning. To encourage such understanding, the Appendix offers a sample list of research questions for further study based on the concerns of this paper. These may be studied by academics and interested citizens alike.

How do students themselves assess their current learning environments?

Using the Taylor Preference Interview (©Taylor & Vlastos) as a model, research what K - 12 students like and dislike about their present schools. Compile and analyze data from the students, who are, in fact, the primary clients of the school system. What are the most and least liked areas of concern? What categories can be derived from student choices? What do students dream about having as part of their learning environments? Use frequency counts to determine priorities and student values or set up a web site to gather information. Share data in community venues and during planning stages for renovation and building of new schools.

What design ideas come from students regarding the design of new schools?

Do we listen to our children about the design of new schools? How would the students themselves solve some of the problems currently found in the schools? How does designing a

school relate to subject matter disciplines: math, science, language arts, social studies, health, and the arts? What projects could engage students in these questions? Next, apply these same questions to community. What treasures are out there that could be used by the schools to make learning meaningful?

If the curriculum and the developmental needs of students are used as design determinants for new learning environments, what will schools and learning environments look like?

How will we synthesize the knowledge of architects with the expertise of educators and ecologists? Identify elements of the curriculum and the developmental rights of students. Link these elements to architectural design considerations. Next, research and create designs for learning environments that act less as passive space and more as learning tools or three-dimensional textbooks. Observe and compare student responses to traditional versus innovative, active learning environments. Develop criteria that will be of value to both architects and the community when designing schools.

How will we research the impact of newly created learning environments?

Design experimental and control group research to track how new learning environments affect:

- concept development in young children
- language and literacy
- creativity
- learning of basic subject matter content
- learning of basic skills
- the ability to make critical aesthetic judgments.

This research could be done so that each student acts as his own control and the research methodology uses a trend analysis format for each variable.

How can the American classroom be reconfigured to become a creative problem-solving studio?

Investigate workplace and studio environments and compile data on:

- traits shared by most of these environments
- how space is used (form and function)
- types of furniture and equipment used
- storage
- display and communication
- technology
- specialized spaces and their qualities.

Apply research findings to the classroom. What items do we need to add to the learning environment? What do we need to take away? How can we link the education of our students to the real world? Use ideas and systems from business, landscapers, laboratories, museums, NASA, foreign countries, etc., to study how space use could be transferred to the American school.

How can playgrounds be transformed into learning landscapes?

Taylor is working on this question through projects at several schools in California in which teachers, students, administrators, and community become engaged in site analysis and landscape design of school grounds. She will train teachers to use these learning landscapes as teaching tools for ecology, science, math, language arts, social studies, the arts, health, and stewardship.

How can teachers and their students be trained to better display visual stimuli in order to communicate with the community and each other more effectively?

Develop a professional training program which uses community resources and local museums to study the art of graphic design and display. Investigate:

- visual/spatial aesthetics
- techniques for creating and mounting displays
- physical set-up
- clarity and selectivity
- purposes of different types of displays
- use of technology
- self expression and using student work (versus prefab or cartoon decorations).

How might the philosophy of Reggio Emilia (Italy) preschools be extended into learning of upper grade students?

Study and visit Reggio Emilia schools (Edwards, Forman & Gandini, 1996), and visualize how such an approach might be employed in this country. What changes in attitude would have to be made? How might Reggio respect for the image of the child as strong and competent be incorporated into learning at all ages?

How might viewing the teacher as facilitator, rather than as instructor, change classroom set-up and traffic patterns throughout a school?

In Japan, some schools require that students remain in one place, while teachers circulate throughout a school. Students take greater charge of their learning environment, from preparing the classroom for different teachers and activities, to cleaning the playground. Perhaps learning

environments should be as adaptable as theatrical set designs. What would happen if student were given permanent work stations and teachers moved to instructional areas to offer support? What new designs and attitudes would be needed? How might patterns within the classroom itself change if teachers were to assume a different role? How does environment affect how students view themselves as learners? Does student stewardship lessen vandalism? This study could involve schematic drawing techniques and mapping of traditional and non-traditional classroom use by students as part of the data collection process.

What protocols can we develop for designing schools as community centers?

What systems can we set in place for the co-location of facilities and other amenities which can be used by the community (e.g., child care centers, museums, libraries, social services, health services, swimming pools, parks, and recreation). Will co-location of facilities lighten or increase the burden on today's teachers? What communication technology might enable services to avoid duplication of effort? Where does culture fit in? In many ways, schools already provide centralized services for students and community. How can these efforts be better coordinated? What are the advantages and disadvantages of establishing schools as community centers?

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