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Rethinking Educational Design in New School Construction

If educational reform were a residence, it could be entered either through the front door or the back door. Since the beginning of the latest era of education reform in 1983, many reformers have chosen the front door, meaning they have approached change directly and in a straightforward manner. Others, however, have opted for a less direct route, approaching reform in the context of other activities such as budget reduction, school consolidation, or the construction of new schools. The focus of this paper is the last activity. To what extent has the construction of a new school provided a useful opportunity to embark on a course of educational reform?

The United States has entered a period of new school construction that rivals the 1950s. Prompted by population growth, demographic shifts from urban to suburban areas, and the deterioration of aging schools, the building boom has even captured the attention of politicians. President Clinton promised, as part of his second term in office, to provide federal funds to assist localities in improving educational facilities.

The primary impetus to new school construction, of course, typically involves relieving overcrowding or replacing outdated or dangerous facilities. Bradley (1996), however, in a study about the role of architecture in education, notes that the physical structure of a school has the potential to be a vehicle for change. In other words, the design of school facilities can inspire

alterations in the nature, quality, and future direction of what goes on inside. The present study sought to determine the extent to which five school systems in Virginia took advantage of building a new secondary school to address the need for fundamental educational change.

The Design of a Study of Design

Between 1989 and 1995 an average of more than four middle schools and three high schools were built each year in the Commonwealth of Virginia. According to a report by the State Superintendent of Public Instruction, the cost per square foot of a new middle school and a new high school by 1995 averaged \$84.80 and \$89.77, respectively.

In order to study the design of new secondary schools, the researchers identified five building projects initiated between 1995 and 1996. The projects included three new high schools—in Albemarle County, Loudoun County, and the city of Manassas Park; a new career exploration center for eighth and ninth graders in Franklin County; and a joint middle school/high school in York County.

For each project, researchers conducted extensive interviews with the superintendent and at least one other district official involved in the design process. In four of the five cases, an architect or construction manager involved in the project also was interviewed. Participants were asked questions regarding the origins and evolution of the project, architectural and educational issues that were confronted, and points of conflict in the design and planning process. Each interview was transcribed and used as the basis for case

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Its primary aim is to facilitate learning.

study development and content analysis, along with various planning documents provided by each district and selected follow-up interviews.

The focus of the present article is the following question: To what extent have selected Virginia school districts used the opportunity for new construction to rethink educational design? "Educational design" refers to *the process of creating the means by which educational intentions can be achieved within a specified context*. Its primary aim is to facilitate learning. Consequently, educational design deals first and foremost with issues and decisions related to the establishment of environments, experiences, procedures, and circumstances intended to promote learning. Educational design is not coterminous with architectural design, though it is clearly related. Building a new school may provide an opportunity to test the viability of an inexpensive new material or an innovative construction technique, but if it has no direct bearing on learning, it does not represent educational design according to the stipulated definition.

Brief case studies of each of the five projects are provided below. Each conveys a sense of the history of the project and the significant educational design issues encountered by local educators. The article then addresses the central question concerning the extent to which new construction is being used as an opportunity to reconsider educational practice. The conclusion suggests several implications for those engaged in designing new secondary schools.

Monticello High School

Monticello High School resulted from the need to accommodate Albemarle County's growing student population. The county school system hired outside consultants to facilitate the design process. Community members, parents, teachers, administrators, and members of the school board and superintendent's staff were selected for a Learning Specifications Design Team (LSDT). The LSDT considered several educational "delivery models" and the impact each would have on school design. These models included departmental, open, modular, divisional, partial house, career academy, house-centered, house-decentered, interdisciplinary, integrated, and community models. The purpose of this exercise was to help those involved in planning the new high school to consider a broad range of educational possibilities before narrowing the options.

The school district's willingness to explore a range

of design possibilities helped establish an atmosphere conducive to creativity. Several educational innovations that otherwise might have been dismissed outright were given consideration. Among those eventually adopted for the new high school were a house system, a ninth grade transition program, flexible settings, and educational partnerships.

The site for the new high school adjoined the campus of Piedmont Virginia Community College (PVCC). A partnership was formed between the two schools that would enhance the high school's curriculum and its facilities. Students wishing to take advanced courses would be able to do so at PVCC without worrying about transportation. The partnership allowed the high school access to PVCC's new auditorium in exchange for access to the high school's new athletic facilities for the community college. This agreement helped to eliminate two potentially difficult design issues: the question of whether or not to invest in a large auditorium and the need to justify funds for extensive athletic facilities.

Concerned over the impersonal atmosphere of many large high schools, the LSDT believed that a "house" system would provide students with a greater sense of identity and readier access to adult assistance. Original plans called for four houses, but construction of the fourth house was postponed when bids came in higher than anticipated and projections revealed that the last house would not be needed immediately. While there was interest in dedicating houses to particular interdisciplinary themes rather than to grade levels, one of the houses was reserved exclusively for ninth graders. It was felt that the transition from middle school to high school is difficult, and a special house for the ninth grade might facilitate the adjustment process.

One of the most pressing concerns designers dealt with was flexibility. Members of the LSDT were concerned that a highly specialized building would become obsolete if current educational beliefs changed. To address this issue, they sought common denominators and arrived at the conclusion that there was a need for space that could be adapted to different uses. Accordingly, the LSDT adopted a plan that provided for variations in the types and capacities of classroom spaces. Each house contained small rooms for five to ten people; classrooms with capacities ranging from twenty to thirty students; and larger spaces for 100 or more students. Instead of being assigned a function in advance, these spaces will be designated as the school evolves.

Potomac Falls High School

Potomac Falls High School was another product of population growth. Loudoun County, a bedroom community for Washington, D.C., has grown dramatically since the mid-1980s. According to the su-

perintendent, the area experienced a 50 percent growth rate over the last five years alone. Potomac Falls High School was the first in a series of several high schools that the county planned to build.

Planning for Potomac Falls High School began in 1990, but was put on hold when the county board of supervisors grew concerned about the effects of the 1991 recession. Designs for the high school remained on the shelf until 1992 when the need for a new high school was reidentified in the county's five-year Capital Improvement Plan (CIP). In 1993 the CIP was adopted by the county board of supervisors, and in 1994 a bond referendum was passed. Under the administration of a new superintendent, it was decided that the size of the new high school would be reduced from 1,500 to 1,300 students (228,000 sq. ft.), and the design process began anew.

As part of the design process for the new high school, teachers from other county high schools were invited to work with the architects. Subgroups consisting of an assistant superintendent, a department chair, and teachers from a given department worked to design the spaces needed for their subject area. Designs created by one department were reviewed collectively by the whole group to insure that they were in keeping with the overall mission of the school. Several educational design issues were raised during the process, including how to facilitate cooperative learning and how to accommodate block scheduling.

Loudoun educators believed that students learn better when they have opportunities to cooperate. They challenged what they regarded as conventional wisdom that supported passive, isolated learning. "We want kids sitting in groups doing joint problem solving, challenging each other's logic, proposing alternative solutions . . . instead of everyone sitting in straight rows and hearing a lecture," said the district's director of instruction. This belief affected several design decisions, including the type of furniture and floor covering and the way in which the foreign language room was equipped.

Cooperative learning calls on students to form small and large groups for activities and discussion on a continuing basis. The traditional canted-top desks used in most classrooms make it difficult for students to form groups, so an alternative had to be found. Further, because the furniture had to be mobile, the floor surface needed to be more resistant to abrasion.

Another example of the concern for a more collaborative learning environment involved foreign language instruction. The foreign language teachers had proposed a design for their classrooms that relied heavily on the use of individual listening stations. This was a state-of-the-art approach that they had read about and seen demonstrated at conferences. The advantages were many, but the one disadvantage was

A faculty cafeteria was added.

that listening stations were permanent fixtures that took up a great deal of space and allowed for little flexibility in instruction. When the designs were reviewed by the full committee, they agreed that the use of individual listening stations was inconsistent with the school's commitment to cooperative learning.

Designers also examined the probable impact of a block schedule on the daily life of the school. One consequence was that teachers would be responsible for ninety-minute blocks instead of the traditional forty-five minute periods. Instruction, consequently, would have to be more varied. Further, teachers with planning periods would no longer have access to their own room in which to plan. Departmental offices, therefore, were incorporated into the design of Potomac Falls to provide teachers with a professional environment in which to plan their lessons, grade papers, and interact with peers.

The creation of department offices raised another issue for designers to consider. With teachers isolated within their own departments, there would be less opportunity for faculty interaction. Designers realized that the omission of a common gathering place might contribute to the fragmentation of the faculty. Consequently, a faculty cafeteria was added to provide teachers a setting in which to interact with colleagues from other departments.

Manassas Park High School

The need for new schools in the Northern Virginia city of Manassas Park had less to do with overcrowding than with the sad condition of existing facilities. Built of wooden trailers lashed together by a cash-strapped new school system, the original high school was literally falling apart. A student, for example, had narrowly escaped injury when the wooden floor gave way in his classroom. Lacking a substantial tax base, Manassas Park was not in a position to replace all of its schools. After considerable debate between the school board and the city council, a decision was reached to build a new high school first.

The design of the new high school evolved over more than three years. Initially, an architect was hired to conduct a school facility study. Site visits to new high schools were made by members of a Building Steering Committee comprised of citizens and educators. Outside consultants were retained to share knowledge of current practices, identify local desires and concerns, and develop a set of educational specifications. One aspect of the new school that would be different from most other projects at the time was its

The circular "drum" served as the "heart" of the school.

relatively small size. While high schools elsewhere in Virginia were being designed for 1,000 students or more, Manassas Park High School initially would accommodate 650 students.

If a vision guided thinking about the design and mission of the new high school, it was the "Information-Age citizen," a multiskilled individual who would be able to work in teams, use the tools of technology, and communicate effectively. To graduate such persons, Manassas Park High School would need to stress interdisciplinary study, project learning, and team teaching, according to school district officials. The architect was charged with the task of designing an environment to facilitate such practices.

What resulted was a three-story, L-shaped design with a circular drum at the inside junction of the two wings. Midway along each wing were large workspaces for teachers from various departments. These offices were located in the middle of wide stairways, thereby ensuring that students and teachers would not be completely segregated when they were out of class. Several "kivas" (small rooms) provided comfortable settings in which small groups of students might work with teachers on special projects. The circular "drum" served as the "heart" of the school, and it was significant that this area housed the arts center, the media center, and a large "commons."

When students are expected to work in teams and undertake project learning, easy access to learning resources becomes very important. Locating the media center at the school's hub was just one way that the design helped fulfill Manassas Park's mission. Computer labs and science labs were located in each wing, ensuring that students in any part of the building would never be far from such facilities. The commons was equipped with 300 outlets so that students could use laptop computers to study and work on projects. A television studio served as an additional resource, not only for closed-circuit broadcasts, but for receiving distance learning programs. In this way, the small size of the high school and its inability to offer a wide range of on-site electives would not result in fewer learning opportunities for Manassas Park students.

The teacher offices were intended to serve other purposes besides promoting interdisciplinary teaming and teacher collaboration. Because the high school would operate on a block schedule, classrooms had to be used by several teachers. With few classrooms dedicated to a particular teacher, teachers required a place to call their own. The offices constituted such places. Located as they were in the midst of wide

staircases, and adjacent to student restrooms, the glass-walled teacher offices also provided supervision for areas where students congregated. Such supervision was felt to be particularly important, given the school's L-shaped design. This design meant that it would be impossible to stand at the end of one corridor and see activity at the other end (past the elbow).

Creating a sense of community clearly was on the mind of district officials as they planned Manassas Park High School. In one sense, community was served by a house arrangement whereby each wing constituted a relatively self-sufficient entity. On the other hand, the central "drum" fostered a sense of schoolwide community by providing an easily accessible gathering place. The superintendent envisioned students working alone or in small groups in the commons area on the first floor of the drum. Sharing the first floor was the arts center, complete with pie-shaped rooms for chorus, orchestra, drama, and visual arts. The faint sounds of music and drama practice would surround students gathering in the commons, which also served as a place to eat lunch and as an auditorium. Examples of student art would adorn the walls. Wrapped around the commons and one floor above was the media center, with glass walls permitting views from above and below.

School planners realized that the need for a sense of community extended beyond the school as well. Lacking a natural city center, Manassas Park required a gathering place. The superintendent wanted the new high school and, particularly its first floor commons, to serve as that civic center. He dreamed of adults using the facility to learn more about computers, access the Internet, or enjoy performances by students and other groups. The design of the drum allowed the commons to be easily used by the community without compromising the security of classes on the second and third floors.

Center for Applied Technology and Career Exploration

The origins of Franklin County's Center for Applied Technology and Career Exploration (CATCE) in Rocky Mount, Virginia, can be traced to projected enrollment growth and the need for additional space at the secondary level. When it became obvious that funds for a new high school and middle school would be unavailable, district leaders considered a more modest facility, one involving eighth and ninth graders only.

For years, concerns had been expressed that many Franklin County students were not making sound educational choices in high school. Part of the problem seemed to be the lack of meaningful learning experiences for the large percentage of students who did not plan to attend college. Representatives of the local

Photo 1. Entrance, Center for Applied Technology and Career Exploration.



business community complained that graduates often lacked the skills to succeed in the world of work. And then, there were those who did not graduate. Franklin County's 6 percent dropout rate exceeded the state average.

If most students expected to find employment after high school and if they were not choosing high school courses that would equip them to be competitive in the workplace, administrators reasoned, why not create a school where students could build career awareness *before* entering high school? Such a school, Franklin educators believed, would not operate like a conventional middle school. A unique set of learning outcomes would be required, along with a new type of curriculum organization, a new approach to instruction, a new staffing plan, and a new form of learning environment.

To undertake such an ambitious educational design project, district officials enlisted broad-based support from teachers, parents, representatives of business and industry, and outside experts. The first step entailed identifying a set of student expectations. CATCE students would be expected to

- develop oral, written, and auditory communication skills
- clarify a career path plan
- develop a work ethic that included responsibility, initiative, self-discipline, integrity, dependability, and appropriate dress
- demonstrate the ability to solve problems effectively in diverse collaborative groups
- develop and apply problem-solving skills using appropriate technology

- develop and apply research skills using appropriate technology
- develop strategies that will help them adapt to change

Rather than relying on standard courses, designers believed that the goals could best be achieved in career-based modules. Modules would run all day every day for six weeks, thereby allowing each student to acquire an in-depth appreciation for what it was like to work in a particular field. A module accommodated thirty students, and each student got to select three modules in which to participate during their eighth grade "work experience."

Building on the advice of vocational education experts and business representatives, eight generic career paths were identified:

- environmental/natural resources
- arts
- manufacturing
- engineering/architectural design
- media design
- legal science
- finance
- health and human services/medicine

Eight curriculum development teams made up of teachers and practitioners from the career area were charged with the responsibility of identifying specific learning targets and experiences. Drawing on the theory of problem-based learning, a hands-on and problem-centered instructional approach was deemed

most appropriate for eighth and ninth graders, so teams also identified problems that might be encountered by practitioners engaged in each career area. Students in the Media Design Module, for example, might tackle the problem of how to produce TV and radio advertising for the products developed by students in the Manufacturing Module.

Every eighth grader in Franklin County would be expected to spend one semester at the CATCE and one semester at their home school. In the Center's second year, ninth graders could elect to attend the CATCE for advanced study. Since all students, not just those headed for employment immediately after graduation, must spend at least one semester at the Center, the curriculum had to be designed to be attractive to college-bound students as well. Thus, many of the modules covered careers requiring college degrees as well as those that did not.

To staff the CATCE, two-person teams were chosen for each module. One member had to be a certificated teacher from a curriculum area related to the module, while the second member could come from the field. This person might be a registered nurse, in the case of the Health and Human Services Module, or an architect, in the case of the Engineering/Architectural Design Module. Franklin County petitioned the State Education Department in Richmond for permission to hire teachers who did not possess a teaching credential. Teachers were hired a year in advance of the opening of CATCE so that they could participate on the Curriculum Development Team for their module. It was expected that these individuals would function less like classroom teachers and more like coaches and team leaders.

One of the most interesting challenges faced by school district planners concerned the facility to house the CATCE. Knowing that a conventional school design could undermine their efforts to foster career awareness and capture the imagination of disenchanted learners, they opted for a design that mirrored the world of work. The structure would look like an office building, not a school. Instead of classrooms, the Center was organized around large flexible workspaces for each module. These spaces contained computer workstations, open spaces for project development, and laboratory rooms for work requiring isolation and the use of special equipment. An auditorium for distance learning and several multipurpose rooms were provided. Instead of a cafeteria, there was a commons where vendors would sell a variety of types of food. Designers believed that students should be able to eat lunch when project work permitted, not when a bell schedule dictated that lunch must be eaten.

Other provisions supported the idea that the Center was not a "school." The day was not organized around a bell schedule. Instead, "workers" were ex-

pected to arrive at the Center and report directly to their module. The dress code for the day depended on the type of work to be done. If students in Environmental/Natural Resources were investigating a toxic spill in a local stream, they might come to school in jeans and boots. Students engaged in selling advertising, on the other hand, would need to wear business attire. Instead of going to lunch as a class, individual students could leave their module when they reached a stopping place, just as they might do in the workplace. Vendors provided food for a two-hour period in the middle of the day.

District officials believed the true test of the Center's viability as a learning environment would come in its second year, when ninth graders had the option to attend or not to attend. If their eighth grade experience with problem-based learning in three career modules proved meaningful, students would be likely to seek advanced work at the CATCE. If, however, the Center was compelled to revert to practices found in conventional schools in order to attract students, officials felt the experiment would have failed.

Grafton High School and Grafton Middle School

York County is a semi-rural district located near Williamsburg and Newport News. With the Chesapeake Bay to the east and urban districts to the south, York County has become one of the fastest growing school districts in Virginia. Whereas in 1980 the population was a little over 35,000, by 1990 this number had jumped to just over 42,000. When a new district superintendent arrived in 1991, the school board identified the expansion of facilities as its number-one concern. York's newest high school, built in 1974 to accommodate 990 students, was bursting at the seams with over 1,500 students. Middle schools required from ten to thirty trailers to handle student overflow.

The school board and superintendent articulated a strong desire to create relatively small schools, thus necessitating the building of both a high school and a middle school. The county board of supervisors, however, was just as forceful in its desire for a more economical route, such as the renovation and expansion of an existing middle school and the building of a new high school. A compromise was reached to build a joint building with the middle school holding 1,000 students and the high school holding 1,200. Sharing facilities would save money, approximately four million dollars according to the local newspaper, and allow school enrollments to be kept relatively small.

The district invited teachers, administrators, and community members to visit sites that had employed a joint-building design. As a plan for the complex unfolded, it became clear that both schools would share athletic facilities, media center, auditorium, and food

Photo 2. Shared atrium, Grafton High School and Grafton Middle School, York County public schools.



preparation areas. Many individuals expressed concern that the middle school would play second fiddle to the high school, so equitable use of the facilities became an important issue in the design process, as did maintaining the individuality of each school. The latter concern manifested itself in various decisions, such as having two separate entrances for the nurse's office—one for middle school students and one for high school students.

Not all of the original design decisions proved helpful once Grafton opened. For example, the creation of two separate administrative complexes, one for the middle school and one for the high school, turned out to be a problem when the decision was made to have an integrated administration, with an instructional principal and an administrative principal sharing supervision of the entire complex. This administrative arrangement, however, did make the sharing of facilities much easier. All scheduling of shared facilities was handled by one individual, the administrative principal. The original plan had required the middle school principal and the high school principal to negotiate on a regular basis how joint spaces would be used.

Technology was important to Grafton's planners. All classrooms, for instance, were equipped with a ceiling-mounted 27" television monitor, providing access to an integrated media retrieval system for laser disks, video cassettes, and CD ROMs, as well as closed-circuit broadcasts. Teachers could communicate with each other and the administration by electronic mail. The atrium had monitors that continuously scrolled information of interest to students. Computers were readily available throughout the middle and high school areas. Because access to in-

Photo 3. Atrium, Grafton High School and Grafton Middle School.



The key feature was that the high school and the middle school would share the same site.

formation through computers was so extensive, designers reasoned that the media center could be downsized. Why provide lots of shelf space for print media when computers could retrieve information from libraries throughout the United States?

Of the five cases of new construction, Grafton was the only one that took advantage of its site to create an outdoor learning environment. Located in a designated wetlands preserve near the York River, Grafton offered a unique setting for the study of specialized habitats and wildlife. During Grafton's first year of operation, a biology teacher received a grant that allowed her students to become designers of a "landscape for learning," planning nature trails and observation sites around the school's grounds.

While Grafton's designers sought to preserve the integrity of both the middle school and the high school, they recognized that many benefits besides cost-savings could result from the shared facility. These potential benefits included curriculum coordination, sharing teachers between schools, and joint professional development. Rather than build provisions for cooperation into their original plans, however, designers decided to allow the two schools to open first and then determine how best to proceed. The reconfiguration of administrative services was the first indication that this patient approach to adaptation was working.

Comparing the Cases

With all the contemporary discussion of reforming, restructuring, reinventing, reengineering, and rethinking education, the creation of a new school might seem a perfect opportunity to initiate sweeping changes in teaching and learning. To what extent were the five new schools described in the preceding section designed to be educationally innovative?

Although similarities were noted, the designs of the five schools also reflected numerous differences. Franklin County Schools took greatest advantage of new construction, designing the Center for Applied Technology and Career Exploration to be a truly unique approach to the challenge of engaging the interest of young adolescents. Manassas Park began with an image of what graduates would need in order to function in the "Information Age." From this vision, the district designed a school that departed in significant ways from its existing high school. Albemarle County incorporated several novel ideas, such

as a "house" strictly for ninth graders, into its plans for Monticello High School, but in most ways the new school resembled the county's other two comprehensive high schools. Potomac Falls High School probably departed the least from the school district's basic design for high schools, although special emphasis was given to cooperative learning. The key feature of York County's new facility was that the high school and the middle school would share the same site. In most aspects, though, Grafton High School and Grafton Middle School resembled other schools in the county.

It is probably not surprising that Albemarle, Loudoun, and York Counties did not take full advantage of constructing a new school to move in a new educational direction. Each school system already possessed at least two other high schools. Any attempt to invent a new type of high school ran the risk of provoking complaints of inequities from parents whose children were assigned to other high schools. Teachers, too, might worry about equity across schools in the same district. Today's trend toward the standardization and coordination of curriculum and testing obviously can further dampen enthusiasm for creative educational design.

Social organization was a major consideration in the design of all the schools. It was manifested in efforts to avoid or counteract the effects of "bigness" associated with secondary schools. Designers seemed cognizant of the fact that secondary schools, particularly high schools, can be cold, impersonal, and overwhelming places. Echoing a call for greater "personalization" sounded in a recent report by the National Association of Secondary School Principals (1996), designers were attracted to size limits, "houses," teams, and cooperative learning. The Loudoun County School Board actually tried to sue the County Board of Supervisors over the issue of school size. The school board had adopted a policy limiting the size of high schools to 1,350 students, but the board of supervisors, which controls the local funding of public schools, insisted that Loudoun's next new high school be built to accommodate 1,800 students. The supervisors were more concerned about saving the expense of another new high school than creating a "personalized" learning environment.

While Manassas Park's new high school was designed for only 650 students, its designers still focused on ways to foster a greater sense of community. Besides organizing the school into houses, they designed the commons area to serve as a central gathering place where students from all grades as well as community members might meet. The ninth grade house at Monticello High School constituted a deliberate attempt to ease the difficulties of transition from middle school to high school.

The organization of work is related to social or-

ganization, and it, too, was a central concern for designers. In some cases, they concentrated on work arrangements for teachers, as in Manassas Park's commitment to team teaching and the CATCE's reliance on pairing teachers for each career module. Interestingly, the school schedule was a major influence on thinking about work organization and school design. Where designers chose to use a block schedule, non-classroom work areas for teachers were a necessity, since every classroom was needed for instruction. Large offices accommodating many teachers as well as phones, copying machines, and computers were designed at most of the new sites. Worthy of note is the fact that these offices were allocated by academic department, except at the CATCE and Manassas Park. A commitment to interdisciplinary teaching led to cross-department mixing of teachers in office areas at these two sites.

The organization of student work also surfaced as a subject of discussion, especially in the cases of the CATCE, Manassas Park, and Potomac Falls. The interest in project learning at the first two schools led to rethinking the design of classrooms. Large, flexible space, workstations, and storage areas to accommodate student projects were major concerns. Manassas Park and its architect even considered changes in furniture design to accommodate new types of learning. Potomac Falls' commitment to cooperative learning resulted in several alterations to the physical design, but other aspects of the educational design were taken into account.

Technology served as an important focus of attention for designers, albeit one associated in most cases with the organization of teacher and student work. Designers of Grafton High and Grafton Middle School downsized the media center based on the assumption that a large area for the storage of printed materials was unnecessary if students had ready access to computers. Manassas Park not only planned computer labs within easy access of students on either side of the school, but also provided 300 laptop outlets throughout the commons. Computer workstations were a primary component of each module at the CATCE. Designers of Monticello High School were able to reallocate space knowing that the neighboring community college was willing to share some of its technology resources. Classrooms at most of the schools were equipped with ceiling-mounted television/VCR units, thereby eliminating problems associated with the storage and distribution of audio-visual equipment. Potomac Falls' designers, alone of all the groups, seemed to have made a conscious effort not to allow technology concerns to overly influence the process of educational design.

Concluding Thoughts about Educational Design

The opening of this article suggested that educa-

Pressures against innovation are enormous.

tional reform can be approached in direct and indirect ways. Research has revealed much more about the former than the latter. The focus of the present study was new construction and the opportunities it provided for indirect reform efforts. It is the researchers' judgment that the design and planning of new schools offers a valuable "laboratory" in which to study the educational reform process, including the politics and economics of change.

The pressures against innovation are enormous. Several of these pressures, including the desire to keep down expenses and a concern in larger school systems for comparability across schools were noted in the cases examined in this article. The very planning process for new construction often serves to suppress innovation. Typically, an effort is made to involve a cross section of the community in planning. Whenever people representing different points of view are brought together and asked to reach agreement, it is likely that their areas of agreement will represent design issues of little controversy. Compromise and innovation may not be mutually exclusive, but they are rare bedfellows in the school design process.

Yet, there is the example of Franklin County's Center for Applied Technology and Career Exploration. Why did this very creative design emerge in a relatively poor, conservative, and rural school district? One guess concerns the initial impetus to build a new school. Alone of the five cases, the CATCE resulted from concern for specific educational problems—the school system's relatively high dropout rate and the lack of interest in school on the part of large numbers of high school students.

The only other school system that came close to taking full advantage of new construction to rethink educational practice was Manassas Park. Designers were persuaded to consider a vision of a new type of graduate, one able to negotiate the challenges of the Information Age. This vision led to new ways to organize work and allocate space.

Without a pressing educational problem or an inspiring vision to guide them, designers in the other three school systems settled for some interesting, but relatively modest alterations. In all fairness, it also should be noted that students in these three school systems generally perform above the state average. A sense of "why tinker with success" could well have acted as a brake on creativity in Albemarle, Loudoun, and York.

As new construction and school renovation con-

tinue in Virginia and across the nation, it will be interesting to see whether the experiences of the five secondary schools in this study are representative of the range of design responses. Educational design need not be characterized by radical departures from convention in order to be effective. It would be unfortunate, though, if fundamental questions about learning, educational outcomes, the organization of instruction, school culture, and the like were not even

given serious consideration in the process of designing the next generation of America's schools.

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