At long last – here is the much anticipated 2009 Conference issue of the Educational Facility Planner and what a phenomenal conference it was! As the primary advocate for effective learning environments, our conferences serve as a tool to share the best and latest innovations in learning and learning environments and we do that through a variety of means.

First, we engage some of the world’s greatest thought leaders to challenge and inspire our concepts and ideas of learning. In Washington, DC, Per Havgaard provided the opening keynote. Per is a gifted teacher and champion for learning, whose empathy for learners who have struggled within the traditional system has fostered a creative approach tailored to the unique strengths of each and every learner. What a great way to kick off the conference and set the tone for the remaining sessions!

Secondly, we listened to past feedback requesting a variety of settings that would encourage more spontaneous and in-depth conversations among our attendees in order to take the content discussed in the sessions and internalize it, equipping our members with the tools necessary to apply these concepts within their individual professions. Hence the Conversation Cafe’ was born – a platform that was embraced by our members and will be on hand again at this year’s conference in San Jose.

Let’s not forget the Extreme Classroom Makeover project that placed CEFPI members alongside students from Charles Hart Middle school to plan, design and assemble an autistic and life skills classroom, putting into practice the ideas promoted at the conference. This life skills area was a first for DC public Schools and has led to planning for additional autistic/life skills classrooms in other DC high schools. There is no greater reward than to create environments that inspire memorable and meaningful learning experiences for all our learners.

And yes, even the golf outing took on a new look and was chosen for its historical significance. The site was Langston Legacy Golf Course, named in honor of John Mercer Langston, an American abolitionist, attorney, educator, and political activist. He was also the first dean of the law school at Howard University in Washington D.C. So as you can see, every event of the conference was connected to learning.

And finally, the conference closed with an inspirational presentation by Christian Long tying the conference theme together making connections between technology, educational trends, school design, and developing web2.0 conversations. His passion was contagious and energized us all as we set out to apply everything we had learned. I came away from the conference feeling empowered, invigorated, and better equipped “to advocate and be a resource for effective educational facilities”. Mission accomplished!

Best Regards,

Judy Hoskens, REFP
The **Educational Facility Planner** is a quarterly publication of the Council of Educational Facility Planners International (CEFPI) and is written, produced and distributed by CEFPI Headquarters, 9180 E. Desert Cove Dr., Suite 104, Scottsdale, AZ 85260. Mailed to all members of CEFPI, the Planner is paid for annually as a part of the membership dues. Non-members may subscribe at a rate of: U.S./Domestic, $60; Canada, $70; Foreign, $85 annually for four single issues; $15 single issue price.

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Your feedback is important to us. We would like to share your comments. Please send to our Facebook account at Council of Educational Facility Planners International (CEFPI).

**On the Cover**
Cincinnati K-12 School for Creative and Performing Arts

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DREAM TO REALITY, A SCHOOL FOR THE ARTS: HOW CINCINNATI MADE IT TO REALITY

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The American Institute of Architecture’s Committee on Architecture for Education (CAE) held their annual fall conference in Helsinki, Finland. Several international studies have rated Finland among the world’s best in student achievement, largely due to the country’s main principles for comprehensive education.

By Steve Crane
Dream to Reality, a School for the Arts:
How Cincinnati Made it to Reality

By Curtis J. Moody

The dream - combining two nationally recognized Cincinnati Public Schools, the current School for Creative and Performing Arts (SCPA) for grades 4-12 and Schiel Primary School for Arts Enrichment for grades K-3, into the new K-12 School for Creative and Performing Arts - has come true.

Project Contributors:
- Jeff Dodge, AIA, NCARB, LEED AP, Project Manager, CR architecture + design
- Ronald Fanning, AIA, PE, REFP, Educational Programming, Fanning Howey
- Terrance Liette, PE, LEED AP, MEPT Engineering Principal, Fanning Howey
- Michael Burson, Facilities Director of Cincinnati Public Schools
- Jan Leslie, Director, Greater Cincinnati Arts and Education Center (GCAEC)
- Erich Kunzel, Conductor Emeritus of the Cincinnati Pops Orchestra, Founder and Honorary Chair of the Greater Cincinnati Arts and Education Center (GCAEC)

Undertaking a project of this magnitude demanded great public support. This project embodies an example of a community learning center for the arts that will provide opportunities for cultivating special interests in any of the performing arts venues – for both students and the broader community. A synergy is formed by the integration of the arts community and the academic community, thus creating a more vibrant mixture of diverse talents in one school.

The visionary and champion for this private and publicly funded project, Erich Kunzel, was key to this project becoming a reality. Several celebrities have traversed the corridors of the current schools: Nick and Drew Lachey, Sarah Jessica Parker, Ron Bohmer, Carmen Electra, Alton White, to name a few. Having visionaries to provide leadership, champion the effort, and reinforce private sector and community supporters, is important. Private sector leadership from the beginning was the primary force used to generate half of the funding for the project goal, which resulted in a commitment to raise $31 million of private funding to match the $31 million of state and local funds which resulted in a total of $62 million budget for design and construction. Additional site acquisition and preparation funding of $10 million was provided by Cincinnati Public Schools. Over 800 private donors, individuals, corporations and foundations contributed to the effort.

Key individuals providing leadership to secure the private sector funding were Erich Kunzel and cur-
rent GCAEC leadership, Tom Klinedinst, chairman; Bill Knodel, president; and Norma Petersen, honorary president. In addition, Nick Lachey, a graduate, produced the MTV show “Taking the Stage” which created international exposure and awareness for the programs at SCPA. Erich Kunzel was the major visionary initiating the gathering of support from the professional arts groups, community supporters and corporate sponsors in the greater Cincinnati area.

Erich’s vision was to bring both Schiel and SCPA together in one building located near his beloved Music Hall, in the Washington Park vicinity. “Our dream has been embraced by people all around the community,” said Erich Kunzel. That vision, widely communicated, eventually matured into what is now the new School for the Creative and Performing Arts (K-12). His dream became a reality through the formation of the Greater Cincinnati Arts and Education Center (GCAEC).

Key to success of the project was Erich and Norma Petersen’s formation of GCAEC and its continued role as SCPA progresses into the future. Erich and Norma gathered arts supporters, Turner Construction and other professionals to produce a feasibility study for the viability of doing this project in this locale. This feasibility study led to the formation of GCAEC in 1996, a non-profit organization designated to raise funds and support this project.

Prior to the formal presentation in Washington, DC, Jan Leslie had the opportunity to capture Erich’s vision and dream on a videotaped interview. After Erich Kunzel’s premature death on September 1, 2009, the facility was renamed the “The Erich Kunzel Center for Arts and Education” in his honor. Without his vision and dedication, this project would not have been the success it is.

In the video interview, Erich’s true passion for the dream is portrayed. The main concept of the building was to locate it centrally within the performing community, giving students easy access to arts professions. Over-the-Rhine is home to many of the premier art institutions of the region, including
Erich discusses the creative synergy that will exist between the younger grades who might glean motivation and inspiration from the next upper grade levels. This creates a great progression of arts education in each student’s respective area of interest. The project is expected to serve as a further catalyst for the neighborhood’s revival. It is the largest urban redevelopment project in Over-the-Rhine, a great historical district as Erich describes it, since the Music Hall was built in 1878.

The key to maintaining success for this public/private partnership is having leadership of the arts community serving as members of the school’s governing Board through GCAEC, working with school-level members to effectively lead this school in a great direction.

The design challenges, including its atypical funding method, nontraditional features, and a tight urban site in a historic neighborhood have made it distinctly unique.

- **Budget Constraints**
  - Develop and maintain the cost model elements and reconcile the cost estimate at 50% and 100% stages of each design phase.
  - Stakeholder’s interests were accounted for in developing the Program of Requirements.
  - $10 million added to budget and programmed square footage reduced to 250,000 total

- **Site Constraints**
  - 3 acre site, 252,000 SF required 4 stories above grade and 1 story below grade.
  - The tight, urban site occupies an entire city block and addresses the city skyline and the opposing Washington Park in Over-the-Rhine.

- **Zero Lot Line**
  - In concert with Construction Manager, the building footprint was kept back from property line preventing costs for shoring at all the sidewalks.

- **Floor Plan Organization**
  - The five story, 252,000-sf school features a 750-seat performance theater, a 300-seat theater for more intimate settings, and a flexible black-box theater.
  - The theatrical spaces are serviced by a back of house scene shop, costume design shop, lighting lab, and sound studio.
  - Inspirational & private areas contained in the same building to support both the arts and the academics.

- **Massing**
  - Keep the form of the building to prevent adding unnee-
necessary volume so that at the end of the project this did not have to be pared down.

- The southwest façade curves back from the masonry context, revealing the main 750 seat theatre covered in zinc and stainless steel panels.

- Elevations
  - Many of the surrounding buildings are of masonry construction. Keeping with this vernacular, the school has masonry veneer, but to reveal the contemporary nature of this facility an “Urban Curve” was introduced.
  - This is a transitional building, going from active downtown commercial area to a neighborhood in transition.

- Aesthetics/Signature Design
  - Owners requested a signature design statement for the building.

- Community Interest Groups
  - Respectful of the neighborhood, the school’s facades adhere to the Cincinnati Historic Conservation Board’s guidelines.

  Curtis Moody continued with championing the project effort to the private sector. This process included developing support materials and identifying people with a shared passion and dedication to the project.

  There were, of course, many funding challenges and several opportunities. Private sector individuals assisted the Cincinnati

One of the visual arts classrooms; this one currently dedicated to the painting students. The left wall shows a blue-colored glazed opening that is an integral part of the design on the northern façade.

The flexibility of the portable seating platforms are shown for the Black Box performance 125 seat venue.
Public Schools in their bond issue campaign to complete funding for a district-wide facilities master plan. With help from the private sector, the bond issue passed and helped to fund this school from the public side. The private sector was mindful that the Board of Education had certain criteria that needed to be met for the education model to be successful. This co-management and sensitivity fostered the growth of this private/public partnership into a fully functioning project team. Setting up a governance agreement, to help govern the administration of SCPA, was one very successful avenue used for maintaining the desired results from the private sector without any sacrifice of academic value as the school continues to grow in the future. GCAEC will have seats on the school’s governing board and will have input on issues such as the hiring of the provost and principal for this school. Immediate needs and future governing issues are contained in this agreement that establishes a new kind of public/private sector partnership to support the new SCPA.

GCAEC also initiated an Arts Endowment fund to help with budget for special performing arts program costs, additional costs for operations of this unique performance venue, and to support arts excellence going forward.

CPS received 23% co-funding from the Ohio School Facilities Commission (OSFC). OSFC brought the state design manual and guidelines for collaboration efforts as a part of their participation in this project. OSFC was also a governing agency with design criteria that had to be approved. The various formats of media depicting the building design allowed OSFC, and others, a more comprehensive review of the building during the design phases. CPS and OSFC’s involvement in the project review and approval process was augmented with GCAEC’s Project Manager/Liaison, David Crafts, retired Procter & Gamble, who assisted from design through to the completion of construction.

With a private sector partner of this caliber, the school district was able to release some of the reins of control on how the project moved forward and was programmed. The magnitude of private monies indicated that this group was capable of assisting in the school district’s and the student’s best interest. All the standard contractual obligations and specific project requirements mandated through OSFC and the State of Ohio were used to comply and foster further partnership between private and public entities. The private sector helped push the effort for the public and private partnership in the fundraising campaign. Some of the means utilized were:

- Donor recognition opportunities within the building.
- Naming rights, seat recognition, brick pavers, academic labs, art donations.
- Potential cost savings through arts support groups/organizations involvement.
- In-kind connections and collaboration with personnel specializing in performing arts groups.

Marketing strategies for potential key donors included:

- Capturing the imagination of the potential donors.
  - Meeting potential donors early enough in the design process so that their desires could be incorporated into the building design.
  - Listening to key investors and the architecture responded to their valued input.
  - None of the initial design intent was sacrificed in following through with these donors’ design considerations.

Meeting with private sector individuals, sharing the dream/vision and all the presentation media that had been developed portraying that dream/vision.

- Discovering which individuals have shared passion for the arts fundamental to this aspect of the project development.

- 3-D models were a useful tool when meeting with potential donors and governing agencies to further enhance the momentum the project was gathering.

- A video fly-through was developed and distributed to potential donors to garner support for this project.

This project is a wonderful example of what can happen when a community is dedicated to the arts and the future of their city. The success of this school is closely tied to the responsible use of public education dollars while addressing the needs and desires to cultivate and celebrate young talent. This unique arrangement enabled SCPA to open its doors in 2010 as the first public K-12 arts school in the United States, one that is both publicly and privately managed.
Learning Modalities and Space

By Jason G. Boone, REFP

As designers, teachers and administrators we intuitively know that different students learn differently, but we rarely intentionally create learning environments for specific learning modalities – especially within traditionally academic spaces.

As planners, designers and educators, we are often content to let “alternative” learning occur in art, music and physical education spaces while defaulting to the standard paradigm for classrooms, which, at best, accidentally and superficially addresses the needs of learners. The REFP workshop presented in September of 2009 at the CEFPI Annual World Conference and Expo provided teachers, administrators and design professionals an opportunity to learn and discuss specific planning tactics and architectural strategies that support the unique characteristics of each learning modality. The article that follows summarizes the content and highlights the outcomes of that workshop.

As a workshop related to how people learn, it was important to model the content of the workshop in the presentation format. Activities were crafted to reach each of the three learning modalities being discussed: Visual, Auditory and Kinesthetic. They included reading text, viewing graphics and making physical models – each with a high degree of physical movement and dynamic participation. The specifics of these activities are discussed in the Pragmatic Example and Official Outcomes section below.

Planning Basics

Before choosing which architectural strategies are appropriate for the learners in a project, there are several planning tactics that are appropriate for all learners. There are, in fact, too many to discuss in detail in an article of this length, but there are two that warrant brief mention. First, carefully consider the building organizational strategy. Plan to permit multiple organizational patterns over the course of the building lifespan. Potential organizational patterns include: grade level, departmental, thematic, developmental, schools-within-schools, learning modality groupings and others not yet imagined. Doing so allows the school to adapt to the continually varying types of learners who occupy the school and provides the school leadership with the greatest organizational agility over the lifespan of the school.

Second, plan for a variety of sized and shaped spaces. We know that the richest educational experiences employ a wide range of student groupings from large groups to small groups to individual study. Consider how spaces can accommodate these groupings at every organizational level: school-wide, grade level, learning cluster and individual classroom. The most effective concepts provide these spaces intentionally rather than accidentally through the simple rearrangement of furnishings. Adopting this tactic allows instructional staff, aides, and administrators the greatest pedagogical agility, the ability to craft instructional strategies for a variety of...
learners simultaneously rather than forcing them to utilize only one instructional strategy for all learners.

Visual Learners

With these planning basics and general good planning practices serving as the foundation for design, there are architectural strategies and design elements that can be deployed to benefit specific types of learners. Visual learners, for example, process information primarily by sight. They tend to prefer visual demonstrations, recognize words by sight, often doodle and stare into space.

Architecturally, it is important to provide a visually rich educational experience. Strategies include:

- **Extensive horizontal surface area** – for creating and viewing images. Rather than the traditional tablet arm-chair desks, consider providing tables with enough surface area to view and create graphics, utilize personal viewing technology, and view multiple items at one time.

- **Vertical writing and “pin-up” surfaces largely for student use** – These zones tend to work best when sized for small-group use and repeated in several areas. Consider pairing them with upholstered stools or other highly mobile furnishings to distinguish their experience from whole group activities.

- **Thread spaces together visually** – use thoughtful transparency, translucency, and opacity to visually connect related and adjacent spaces in a meaningful way.

- **Articulate focal length** – provide a variety of focal distances including near, as in reading a book or viewing a computer screen; mid-range, as in viewing a projection screen, marker board or other large group viewing area; and long-range, as in viewing an interior vista across a large space or to distant features in the exterior environment.

We created a theoretical example where we imagined a learning zone dedicated to visual learners to illustrate architectural strategies for visual learners. It was a suite of spaces that was zoned for large group, small group and individual study activities within the “classroom” itself. The large group zone was shaped to resemble an eye in plan and both served to focus students' visual senses on a large parabolic view screen as well as represent the learning modality in the architectural experience. Off to one side were parabolic alcoves glazed with writable surfaces. They were intended to allow visual transparency between the learning zone and the adjacent spaces and provide vertical student-owned surfaces for small group work. Finally, in a semi-isolated area, there were a series of individual student workstations, each large enough to engage visually with technology, printed text, artwork or all these elements simultaneously.

Auditory Learners

Auditory learners, as the label suggests, process information largely through their sense of hearing. What is interesting about their process, however, is that it often involves vocalization. These students like to listen, but they can not wait to talk. Even when studying alone, they tend to make sub-vocalizations. Architecturally, it is critical to consider the acoustic qualities of a learning space, but also important to provide opportunities to communicate with one another. Specific strategies include:

- **Choose soft and highly mobile furnishings** – to promote student-directed small group discussions and dampen the discussion noise.

- **Make mobile, vertical pin-up surfaces from fabric or other absorptive materials** – to encircle each ad-hoc small group discussion area.

- **Acoustically isolate individual study areas** – so that students listening on headphones to content can make sub-vocalizations without disturbing others.

- **Spaces with different acoustical characteristics are appropriate.**

- **Noisy spaces are okay and should even be encouraged.**

- **Serene spaces are necessary to provide shelter from noise on occasion.**

- **The architecture should express these acoustical qualities in the furnishings and finishes.**

Kinesthetic Learners

These are tactile learners. They process information by using their
bodies, their sense of touch and through movement. When forced to sit still they often tap their fingers on the desk, find reasons to move about, and quickly wrinkle their clothing. Architecturally, it is most important to recognize these characteristics and provide places to move and ways to interact with content. Strategies include:

- **Alter the way large group presentations and demonstrations are conducted** – consider projecting on the floor while students stand around,
- **Provide open floor space** – for students to “build,” experiment, or simply define their learning location for themselves,
- **Utilize adjustable height furnishings** – so that students can interact with content while seated or standing, and
- **Reconsider the ground plane** – if at all possible provide the opportunity for learners to change elevation.

During the modeling portion of the workshop, the group responsible for kinesthetic learners chose to leverage the room in which we were meeting as a demonstration of using what is available rather than make a scale model. The other participants were asked to perform a round-robin series of tasks demonstrating what they had learned in the workshop, each at a different location and each requiring a different means of interacting with the room. It was a great statement about what can be accomplished when designers and educators are informed about the learning process, even within existing spaces and without great expense.

**Pragmatic Example and Official Outcomes**

As was mentioned previously, it was important to model the content of the workshop in its presentation format. The activities conducted were aimed at each of the three modalities. First, content was presented in graphic and written forms. Two local administrators presented information related to the qualities and characteristics of each learning modality while participants viewed both a PowerPoint presentation and boards filled with graphics and text posted vertically around the room.

Second, we invited small groups to design and make a physical model of a learning environment suited for a specific learning modality as a means of modeling kinesthetic learning. Participants crafted their models from not only the materials we provided but also from local materials gathered within and just outside the conference hotel. The final products were presented on the floor and design characteristics were recorded on flipcharts. Interestingly, several architectural strategies were mentioned related to all three learning modalities and should be interpreted as important to all learners.

- **Make learning visible** – leverage interior glazing and transparency to allow learning to be visible from outside the learning environment.
- **Provide multiple sizes of spaces** – intentionally create “inbetweenie” spaces, large group and small group spaces for learning; go beyond the simple one-size fits all, one-size does all classroom paradigm.
- **Provide access to the exterior environment** – not only visually, but physically; leverage site characteristics as part of the learning process.
- **Allow for movement** – design spaces that encourage learner movement, horizontally and vertically rather than stationary and pointed in a single direction.

And finally, we held a short *pecha kucha* to model auditory learning. A *pecha kucha* is a presentation format intended to keep the speaker honest and moving. They are designed to be a fixed number of slides within a fixed timeframe. One of the presentations was a vocational school project whose design was derived in part from the content of the workshop.

Three learning areas were highlighted as examples of learning environments slanted in the direction of specific learners. The first environment was the Criminal Justice Lab, a suite of spaces intended for the study of law and law enforcement. The suite includes...
large group, small group and individual study zones, but was included because it served as a model for auditory learners. One portion of the suite is dedicated to mock trials where students are expected to demonstrate their speaking and listening skills. Another zone is dedicated to small group discussions with limited horizontal surface for spreading out of materials. Finally, the individual study zone is an enclosed room that acoustically isolates it from the remaining spaces.

The second environment was the Graphic Communications Lab and served as the example for visual learners. This suite of spaces is essentially an art room with production facilities. It is also organized into large group, small group and individual study zones, but each are articulated for visual rather than other types of learners. First, the entire environment is related to the creation, review and production of images in all their forms. Each zone is rich with extensive horizontal and vertical surfaces. And, with the exception of the darkroom, every zone has a high degree of visual transparency into the adjacent spaces.

The final environment presented was the Robotics Lab, which served as the example for kinesthetic learning. As with the other two, it is zoned into large group, small group and individual study, but these areas manifest themselves slightly differently than the other two. Unlike the previous examples, the Robotics Lab provides for more student movement than the others. There is extensive open floor space, fewer furnishings and activity centers are spread out – design, production and assembly areas all separate – to encourage the flow of students from one to the next.

Conclusion

Different students learn differently. Visual learners process information primarily through sight. Auditory learners process information primarily through sound (and speech). Kinesthetic learners process information through interaction with their body and through movement. The educational experience of these learners can be greatly enhanced when educators, policy makers and design professionals recognize their differing needs and intentionally craft environments with those needs in mind. As the photographs taken over the course of the workshop suggest, participants were excited to be able to move about, contribute in a meaningful way to the workshop and learn in a way that suited them best. And if nothing else, this is a worthy goal for all teaching and learning spaces.

Jason G. Boone, REFP

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School Transformation + Development Map

By Dr. Frank M. Locker

The field of education has highly varied educational practices and facilities needs. Still, much of education continues to be delivered in the recognizable tradition of teachers working alone in isolated classrooms and buildings planned based on rows and rows of those classrooms. But there is no longer one single, universal view of how education should be delivered and in what types of spaces it should take place.

The Situation

The field of education has highly varied educational practices and facilities needs. Still, much of education continues to be delivered in the recognizable tradition of teachers working alone in isolated classrooms and buildings planned based on rows and rows of those classrooms. But there is no longer one single, universal view of how education should be delivered and in what types of spaces it should take place.

Effective educational planning first requires a careful, thoughtful planning process that includes all stakeholders. The planner/facilitator needs to outline a range of possibilities in both educational delivery and facilities concepts, including presenting research on learning, a review of current educational deliveries, and examples of role model schools, and then lead the stakeholders to evaluate and conceive ideas for the most appropriate educational and building concept choices for their schools. The resulting educational “vision” is then supported by strategies for professional staff development, starting with a search within the administration and teaching ranks for early adopters of effective innovations. Facilities are then planned in a way that supports the stakeholders’ choices of how they want to go forward with education. Bearing in mind that facilities are to last 40+ years, their design must take into account the responsibility of embracing innovations whether they are established, embryonic, or anticipated.

The Challenge

The challenge to educational planners is this: there are very few ways of framing a discourse among key stakeholders. Educators tend to understand education primarily from their own professional situations. Architects tend to know about facility design primarily from their own most recent experience, perhaps in a different community, with different wants and needs. Other critical members of a school planning team, students, parents, and business and community leaders may have enthusiasm for the project but likely have little understanding or experience beyond their local schools. Without a deep facilitated dialogue on research in learning, clarification of programs and practices, and facilities concepts that support the full range of educational deliveries, the most likely prospect for facilities is “default design” supporting the school’s current teaching practices.

School Transformation + Development Map

The School Transformation + Development Map (© Frank Locker Inc) was developed as a concise tool to support this important discourse. The School Transformation + Development Map (ST+DM) is a messenger of varied practices, an organizer, and a basis for dialogue.
among school stakeholders about the future practices of and plans for their schools. It presents the full range of educational practices and facilities planning concepts in an organized form, constructed to establish key concepts and outline highly nuanced variations, offering a variety of “right” ways to proceed.

The ST+DM notes more than 150 different educational delivery practices and 100 facilities planning concepts. These are categorized in related groups: educational delivery, for example, includes instruction, relationship building, and professional development, among others. Within these categories are practice issues such as cooperative learning, scheduling, exhibitions and learning locations. Facilities issues include overall planning, specific spaces and furniture and equipment. Within these are considerations of student groupings, support for parents/volunteers, student movement, and teacher planning centers.

**ST+DM Organization**

Both educational delivery and facilities concepts are organized in five columns, ranging from Maintaining Tradition to Transformed. Placement of the 750+/- articulated educational practices and 500+/- facilities concepts within the ST+DM framework has been done with reference to research and recognition of the nuances of current practices. Assignments to the traditional column were perhaps the easiest to make, as we all tend to know what exemplifies tradition. Assignments to the other four columns were informed by research in learning to the greatest extent possible, arranged in a transitional progression across the five columns.

Thus, for example, the row for Teacher Teams is organized as follows:

**Column 1:** Self-contained classroom teaching exclusively

**Column 2:** Common planning time to coordinate curriculum/know students

**Column 3:** Teachers swap classes for sharing instruction

**Column 4:** Occasional team teaching

**Column 5:** Teachers teach synchronously in coordinated teams

Column 1 probably represents the current most common practice for this Teacher Teams issue. Common planning time, teachers swapping classes, teacher teaming and synchronous team teaching are innovations of varying degrees evident in schools across the country. Synchronous team teaching, Column 5, is the least common, and arguably the most effective. Teachers engaged in this practice report significantly more effective educational delivery, greater professional growth, with heightened ability to pay attention to individual student needs.

The row representing Delivery is also instructional of the ST+DM. It is organized as follows:

**Column 1:** Almost exclusive lecturing

**Column 2:** Lecturing with some discussion

**Column 3:** Lecturing and regular group discussion

**Column 4:** Lecturing, group discussion, and some problem solving

**Column 5:** Project-based learning, discussions, and just-in-time lecturing

Research indicates that lecturing, which has been with us since the beginnings of public education, is a less effective delivery method than more engaged methods such as discussion groups and project-based learning. Thus Column 1 expresses lecturing. The other columns express a progression to more effective, engaging, innovative modalities.
The ST+DM has been the subject of REFP workshops at CEFPI world conferences for the last three years. Additionally, it has been used by the author in educational planning workshops for school clients since 2004. Generally speaking, the reception is one of amazement that the field of education is so rich with opportunity.

Many people assume that column 5 is “better” than the other columns, but the purpose of ST+DM as a map is not to assign preferences but to display the territory to facilitate the dialogue on preferences. Some argue that column 1 or 2 practices are more effective than those in other columns, especially for some curriculum areas.

**ST+DM in Practice**

At the CEFPI world conferences, the ST+DM has been used in REFP workshops to judge how entries in the facilities design awards competition fit within the ST+DM framework. Workshop participants are charged with the task of awarding several ST+DM “trophies.” Since the competition entries abundantly display facilities concepts, and educational concepts through implication or short descriptions, the review focuses primarily on facilities design. REFP workshop participants work in teams, discuss the competition entries, and honor selected entries with designations such as “Most Like Column 1,” and “Most Like Column 5.”

The ST+DM is used by the author and other CEFPI members on a daily basis as an essential tool in educational visioning workshops. Participants in these workshops, representing educators, students, parents, business, and community, are asked to consider their school and develop the ST+DM score in four categories:

- Educational Practices Today
- Educational Practices in the Foreseeable Future
- Facilities Today
- Facilities in the Foreseeable Future

They develop their scoring either individually, using an Excel version available to facilitate this assignment or, more effectively, in small group discussions. Responses on the separate 150+- Educational Practices lines are consolidated into a single score, and the 100+- Facilities lines are averaged to become a single facilities score. The result is a powerful statement about degrees of desired change and innovation, expressed in numbers. A recent project for Duxbury, MA High School represents the results from many similar schools. Overlaid on the ST+DM summary sheet, the scores look like this:

By conventional measures, the school is highly successful, but it admittedly has a preponderance of lecture courses, little integration of curricular areas, a schedule that frustrates any form of collaboration and minimal continuity or communication with the middle school. High priorities included project-based learning, common planning time, integrated instruction and articulation with both the middle school and colleges. The ST+DM made all this visible. For the workshop participants, the ST+DM scores had great significance. Educational practices are diverse, and often difficult to make visible. The ST+DM makes practices visible. It also provides a platform for discussion. The simple challenge of evaluating current and desired future practices and facilities concepts through group discussion becomes lively debate over the assignment of current practices and best approaches for the future.

Testimony to the lasting power of the ST+DM in people’s minds is this anecdote: the ST+DM was used as a tool in the educational visioning for a new 1400 student high school. Such a large building takes years to design and build. When the author visited in the year after completion, almost four years after the initial ST+DM scoring, the school principal was waiting at the front door with the greeting “Welcome to our 3.68 high school.” The ST+DM is available as a PDF at www.franklocker.com.
Planning for Change: Flexible Design Solutions

By Craig Mason, AIA

During the past ten years, Federal Way has pursued a new, flexible model of design for schools within the district. On a parallel path, DLR Group has designed several flexible high schools across the country to enhance both the lifecycle and functionality of schools.

The intersection of technology and the 21st Century learner has challenged many school districts to rethink their approach to the design of school facilities and the definition of “classroom.” To strategically plan for the future, districts must not only consider facilities and curriculum, but understand a process of change that is continually redefining the educational experience of students and teachers.

For the past 100 years, school designs have evolved along with educational programs and instructional theory. The design approach to facilities was reactive. Renovate and remodel, or in extreme cases demolish and rebuild, every 10 to 20 years as a response to changes in educational theory, population, and technology. This has proved to be an unsustainable approach. We cannot financially afford to tear down and build new. We cannot environmentally afford to claim greenspace for new construction.

Our design approach must change. The solution is a new kind of school that can evolve with, and

Panther Lake Elementary School diagram up ~ DLR Group
quickly adapt to changing educational models, technological advancements, teacher skills, student needs and community expectations.

The challenge is a stereotype: the classroom. It has four solid walls, a door, rows of desks to hold 10/20/30/40 students and a teacher instructing in front of a board. But what if we have 60 students next year? What if lower grades show there will be 120 students in three years? What if a teacher needs to talk to another teacher in the middle of class? What if every student has a laptop but no Wi-Fi connectivity? The solution used to be tear it down and start over.

**Flexibility in Federal Way, Washington**

The Federal Way School District, located between Seattle and Tacoma, Washington, faced such issues. Like many school districts, it resorted to a tear down and renovation process in response to enrollment pressures, evolving educational programs and students’ needs. Endless construction costs and seemingly endless delays in implementing improved teaching and learning strategies for its students and teachers prompted Federal Way to rethink its space programming approach.

During the past ten years, Federal Way has pursued a new, flexible model of design for schools within the district. On a parallel path, DLR Group has designed several flexible high schools across the country to enhance both the lifecycle and functionality of schools.

In Federal Way, the district and DLR Group collaborated to design
multiple elementary schools using this flexible approach to plan for and accommodate changes needed to support the learning needs of all students. Together, Federal Way and DLR Group are witness to the success this new model can offer to districts, students and communities across the nation.

DLR Group’s design for a series of Federal Way elementary schools creates flexible, easily adaptable interior spaces. This non-specific approach shatters the stereotype of the classroom, producing a facility with unparalleled capability of evolving to meet the changing demands of educational programs and curriculums.

Panther Lake Elementary School

In September 2009, Panther Lake Elementary School was the first of the DLR Group designed schools to open its doors to students and staff.

The design team adhered to Federal Way’s Guiding Principles during the design and construction of each school project within the district:

- Teaching and learning needs will change in the next 10 years
- The building is not the change
- The building allows the change
- Flexibility and convertibility is the key to our success

The Panther Lake design is grounded in the Federal Way Guiding Principles. Traditional specific program requirements were reorganized into groupings defined by spatial similarities, i.e. per general size, functions and features.

From these groupings the design team was able to distill the program down to six fundamental types of spaces which make up the basic building blocks of a flexible spatial program:

1. Network
2. Spaces
   a. unique space of each school that reflects that school’s individual character, focus and identity
   b. organic and connective, these spaces are intended for social development and academic achievement (especially literacy)
3. 30s – specialized learning spaces that can accommodate larger groups and equipment
4. 25s – core learning spaces that accommodate typical class groupings
5. 5s – smaller group spaces that can alternatively be used for administrative support
6. Gym – large group assemble for multiple uses including community
7. Support – everything else

Panther Lake Elementary School is designed with a series of bars and lanterns. The school’s fingers are composed of program spaces connected by hallway lanterns. Clerestory glazing in the lanterns, coupled with windows in the classrooms, provides natural daylighting in every single classroom in the school. Nodes in the hallway walls bring daylight into the commons spaces as well.

Although the final plan looks surprisingly like a traditional doubled-loaded corridor, it is far more complex. The school’s transecting commons is anything but a corridor. Kinetic shapes and colors define spaces for key shared-use functions, creating spatial movement east-west through the school, as well as providing an interior ramp that descends four feet to the east within the site. Wall and ceiling forms define distinct “spaces,” each opening to the next, with windows looking out over the site.

This non-specific approach to school design not only accommo-
dates students and staff now, but well into the future, and allows the district to quickly make building modifications over time with minimal construction and associated waste.

Designing sets of rooms with similar sizes and similar technology systems allows their use to flex and respond to various demands based upon the needs of the school and curriculum. For example, every classroom-sized space is wired for data and ready for wireless connectivity, each has a sink, all furniture including most classroom storage is portable and no space is overly supplied with specific built-in amenities. Over the course of a few years, the same room could potentially serve as a classroom, a staff lounge, or a computer lab.

More unique areas, such as the commons, are designed to promote interaction amongst students in an open, less rigid environment. These specific areas are designed for the long-term, and typically serve a variety of both educational and community-use functions.

The design employs a shell-and-core system comprising a set of rated walls from daily change to 50-year permanence. Building systems – mechanical, electrical and plumbing – run only through floors and permanent walls. Radiant-floor heating leaves the school free to adapt to future needs with minimal expense of resources or waste. With this approach, the school will be able to support whatever curriculum, teaching style and/or educational strategy is preferred or relevant at any given time.

To further conserve resources, the Panther Lake design uses an absolute minimum amount of finishes, bare concrete flooring, bold painted walls and recycled cotton treatments over more conventional materials.

An Exercise in Flexible Design


After a brief presentation, the audience broke into small groups for a scenario planning exercise, which stimulated great dialogue about approaches to flexible design. Each of the six groups was given a generic floor plan and was charged with creating a unique design solution to accommodate future educational models with minimal disruption to the existing structure.

This exercise encouraged attendees to think outside a typical school design and realize how a unique approach to temporary design could actually meet the needs of a school building for many decades.

Craig Mason
Principal
DLR Group

Craig Mason is an architect and educational planner of uncommon talent. As a Principal at the DLR Group and the Education Studio leader for the firm’s Northwest region of the United States, Craig is responsible for all education facilities planned and designed by the firm’s Seattle office. Additionally, Craig is a member of DLR Group’s national K-12 Education Forum, and has served as a senior design team member for a number of award-winning educational projects. Craig’s outstanding and innovative work with educational facilities has established him as one of the most creative educational architects practicing today.
When Funding is Scarce: Making the Best Use of Existing Facilities

By Amy Yurko, AIA

In this environment of economic uncertainty, school districts can be faced with tough decisions in their attempts to provide students and teachers with safe and functional facilities for teaching and learning. To accommodate program changes and enrollment fluctuations as well as aging facilities and limited capital budgets, it is increasingly important to find ways to get the most from existing facilities.

Various strategies for evaluating and enhancing utilization of existing space can be quite successful when applied appropriately and thoughtfully. Parameters such as capacity, scheduling, operations, shared use, program offerings, and room assignments can be assessed and rebalanced to alleviate or even solve space challenges. The first step is to explore and understand the full range of needs: educational, operational, functional and perceptual. The next step is to assess the existing facilities to locate key areas of misalignment – spaces that are not being used so effectively – and to make note of areas of alignment – spaces that are being used effectively. An “overlay” or comparison of these first two steps will yield key insights into the actions required to enhance the overall use of the facilities.

While in-depth discussions of all of these parameters are important, this article simply scratches the surface by including a few case studies to illustrate various approaches to enhancing the effectiveness of existing school facilities.

Facility Assessments

Measuring the effectiveness of a school facility includes assessments of two key aspects: the adequacy of the space itself and the efficiency with which it is used. The first parameter measures physical characteristics such as size (square-footage) and proportions, structural integrity, air quality, lighting, power and data access and the like. Most of these characteristics require capital to correct or to otherwise modify, although shortcomings in a few of these can be mitigated with little or no money spent on the physical facility.

It is important to note that any action taken to enhance facility utilization should also support educational goals of the school. For example, a narrow hallway causes congestion and tension during passing time at a high school. One solution to alleviate congestion is to move student lockers out of the area or limit student access to their lockers during the most congested times. Another idea is to organize classroom assignments into grade-level clusters or interdisciplinary teams, which can reduce the travel distance for students or even the number of students in that area of hallway at any given time – a solution that is only viable if such clustering or teaming supports the curriculum.

Room Assignments

Here’s another example: in schools where class sizes vary and classroom sizes vary, assigning larger classes to the larger rooms and smaller classes to the smaller rooms makes the best use of the available space. School leadership should keep a chart of classroom sizes handy when assigning students and teachers to each classroom, and teachers should be willing to switch rooms as needed.

The example elementary school illustrated in Case Study #1 (names and locations of case study schools are withheld by Owner requests) was built in the 1980s and has seen challenges of enrollment growth and increases in needs for special services. School leadership and staff have responded to these challenges with a series of modifications which have solved their immediate needs, but have also compromised the original clarity of the school’s floor plan as well as some of their key educational goals. The before-and-after plan diagrams show a re-balancing of room assignments that went a long way towards enhancing the functionality of the school given these current challenges. Additional goals achieved by the room reassignments include: organizing class-
rooms into grade-level clusters, locating the early childhood in a classroom with a dedicated restroom, assigning like grades to classrooms with operable partitions between and providing more appropriate spaces for staff and student services.

Operational Considerations

In addition to exploring the physical needs of a school facility, operational aspects such as staffing and scheduling should be considered. In a recent assessment of a K-8 elementary school, additional space for physical education was needed. Several PE classes were being conducted in the school lobby and hallways just to meet the minimum curriculum requirements for all the students. When various aspects of the situation were evaluated, it became clear that a key challenge was the time involved for the school custodian to set-up and clean up the multi-purpose space before and after lunch. Several solutions were proposed, and resolution was achieved by soliciting parent volunteers to assist the custodian in more quickly transitioning the multi-purpose room from gymnasium to lunchroom and back. The time saved allowed the multi-purpose room to be used for PE activities for two additional classes per day and the school lobby and hallways were quiet again. What began as a physical space concern was actually alleviated through an operational strategy, in this case using volunteers, at no additional cost to the school.

Time & Schedules

Time plays a critical role in the assessment of school utilization and efficiency, particularly at the middle and high school levels where students often move between classrooms for different academic subjects. Daily schedules coordinate student movement and room assignments in support of a school’s educational goals as well as individual student needs. Adjusting school schedules can be another strategy for making more efficient use of available space. For example, a small elementary school district employed a single music teacher to offer music instruction at all its schools. By tweaking the teacher’s schedule and route between sites, all schools achieved better use of their activity rooms and were able to offer music to a greater number of interested students.

Another example highlights a middle school whose student population had outgrown its facility. Portable classrooms were added, but persistent challenges included an excessive number of “travelling” teachers – those who picked up their instructional materials between classes and moved from classroom to available classroom. At this particular middle school, students were organized into three teams per grade, and the schedule allowed for each team to participate in electives or exploratory programs (art, music, health, PE, languages and the like) as a team. Even though the school was overcrowded, staff members were committed to maintaining this team structure and were doing their best to offer high quality instruction off of their carts.

The solution at this school was multi-faceted, including a combination of room reassignments and schedule adjustments, both of which enhanced the teaming approach while also reducing the extent of shared classrooms from nearly 60% to 15%. One strategy was to cluster each grade level into contiguous classrooms. Two classrooms per grade would be shared, but only within that grade level. The schedule for exploratory classes was rebalanced to assign a minimum of one team from each grade level to participate in exploratory programs, leaving their shared classrooms to be used by other two teams. This strategy ensured that shared classrooms
were used for core curriculum, by like-grade levels and by like subjects wherever possible. In other words, the 6th grade science classroom wasn’t being used for 8th grade world languages anymore, much to the delight of both teachers. In addition, hallway congestion was alleviated by eliminating, or greatly reducing, the mad dash of teachers with their carts during passing periods.

**Facility Modifications**

It may go without saying that any space where the health, safety, or security of students and staff is compromised must be physically addressed before any discussion of utilization and efficiency is appropriate. In fact, these basics should be included in the “needs assessment” or first step as noted above. Once the welfare components of a building’s occupants are satisfied, even the smallest facility modifications can have a large impact on the efficiency of a school.

The diagrams for Case Study #2 illustrate another elementary school’s before-and-after planning to enhance the use of their existing building. The “fit analysis” diagram captures the critical areas where the building is out of alignment with the school goals. Among other problems in the existing school, several classrooms are small and of awkward proportions, and the main office is too far from the front door of the school. Relocating the front office, clustering grade levels, assigning smaller classes to smaller classrooms, and making use of a connected historic structure for a new library are a few of the recommendations. While some of these require reconstruction funds, the work is all interior and can be completed during the school’s summer break. And most importantly, the resulting school will much more closely meet the needs of the students and staff.

**Found Spaces**

Teachers and school administrators are fantastic at making use of every available space in their facilities. This is why no school ever has enough storage space – because spaces originally designed to be storage are often assigned other uses, such as offices and even classrooms! During one middle school assessment, we found a stunning room, called “Memorial Hall”, unfortunately used for storage of office supplies, reams of paper and lunch tables when the adjacent lunchroom was cleared for PE. Memorial Hall was a magnificent space with carved marble walls and floor, a vaulted ceiling dedication and recognition plaques, and carved wooden doors leading from the school’s main entry and connecting the adjacent gymnasium and circulation hallway. One of the school’s many building additions over the years relocated the main entrance and school office, so this historic space was no longer even seen by students. Moreover, the “new” location and configuration of the main office was no longer effective, was remote from the drop-off loop, and lacked a conference room which was sorely needed by the faculty and staff.

The proposal in Case Study #3 recognizes perceptual as well as functional issues as it reestablishes the building’s historic main entrance, relocates the main office, and engages the Memorial Hall as the much needed conference room – allowing the grandeur of the space to be appreciated while the space is not wasted. Storage for supplies and tables are more appropriately moved to rooms intended for storage, which previously housed various offices.
In conclusion

In every school construction project, it is difficult to predict future enrollments, staffing and evolution of educational programs. Over time, occupants satisfy current needs by reconstructing, reconfiguring, reassigning, appending and otherwise modifying existing facilities. This is both normal and expected. But when all needs and parameters are considered collectively, these needs can often be addressed and challenges can often be alleviated without major capital expenditures. The goal is to maintain functional and educational relevance over time while also ensuring that resources are used wisely.

Amy Yurko, AIA

Amy Yurko, AIA is founder of BrainSpaces Inc, a Chicago-based consulting firm that offers programming, planning and design services for schools. As a speaker at the 2009 annual World Conference of the Council of Educational Facility Planners, her workshop focused on how schools can make the most of available space within ever tightening budget constraints. For information and more site-specific examples, contact her at ayurko@brainspaces.com.
The review is designed as an update to the 2002 review “Do School Facilities Affect Academic Outcomes?” by Mark Schneider, originally commissioned by the 21st Century School Fund’s Building Educational Success Together collaborative and then expanded by Dr. Schneider and published by the National Clearinghouse for Educational Facilities.

Recent research continues to point to a small but steadily positive relationship between the quality of a public school facility and a range of academic and community outcomes. This study reviews the literature on: facilities & academic outcomes, school building systems, school facility condition and community factors.

This new review includes an extensive bibliography of research since 2002 and discusses the need for future school facility research.

Mary Filardo
Executive Director
21st Century School Fund

Mary Filardo, Executive Director, founded the 21st Century School Fund in 1994 to provide the District of Columbia and other urban communities with leadership, innovative financing solutions, research, and public policy analysis of school facility issues. She is a leading national authority on school facility planning, management and public private development. She has helped plan innovative projects in Washington, DC — J.F. Oyster Elementary School public private partnership (2001), Thurgood Marhsall Academy Public Charter School campus development (2005), School Without Walls high school university and public partnership (2008), Savoy Elementary School (2008) and many others.

Jeff Vincent, PhD, MCRP
Deputy Director
Center for Cities & Schools
University of California, Berkeley

Jeff Vincent is Deputy Director and Co-Founder of the Center for Cities & Schools, University of California, Berkeley. In addition to working for five years as a teacher at a Montessori farm school, he has worked in city planning and community development related positions for nearly 10 years. Jeff's research looks at the intersection of land use planning, school facility planning and community development. Jeff also serves as a researcher with the BEST (Building Educational Success Together) collaborative conducting analysis of the scale, scope and distribution of public school capital expenditures across the country.
<table>
<thead>
<tr>
<th>Independent Variable Type</th>
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<td>Facility Overall Compliance Rating</td>
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<td>Six measures of facility condition</td>
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<td>Rural Texas high schools (n=72)</td>
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<td>School building condition index</td>
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<td>Elementary schools in New York City (n=95)</td>
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<td>School condition (in need of repair), % temporary space, custodians/sq ft, &amp; sq ft/student</td>
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<td>Schools in Houston, TX (n=226)</td>
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<td>School condition rating</td>
<td>Commonwealth Assessment of Physical Environment assessment completed by school principals</td>
<td>Test scores (percent passing middle school SOL exam)</td>
<td>Virginia middle schools (n=111)</td>
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<td>Condition &amp; Design</td>
<td>School facility design &amp; condition grades</td>
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<td>Test scores and teacher health, attendance, and retention</td>
<td>Teachers in Chicago, IL &amp; Washington, DC (n=668 &amp; 1273 respectively)</td>
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<td>Design</td>
<td>Eleven design variables</td>
<td>Researcher-completed assessment using the Design Assessment Scale for Elementary Schools</td>
<td>Test scores (reading, math &amp; writing)</td>
<td>Schools in a large urban Texas school district (n=20)</td>
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<td>Three school design elements (movement and circulation, day lighting, and views)</td>
<td>Researcher observation</td>
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<td>Rural and suburban Georgia schools (n=71)</td>
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<td>Capital Investment</td>
<td>Passage of a capital bond by the school district</td>
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<td>Test scores (various CA tests at a range of grade levels)</td>
<td>California school districts (variable sample by type of analysis, maximum n=948)</td>
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<td>Results</td>
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<td>Approximately 5% more likely to stay in a building in &quot;A&quot; condition vs. &quot;F&quot; condition</td>
<td>Buckley, Schneider &amp; Shang 2005</td>
<td>Peer-reviewed journal article</td>
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<td>Teachers in schools in satisfactory conditions are significantly more likely to express positive attitudes about their classrooms than teachers in unsatisfactory buildings (across a wide range of indicators, but limited sample prevents causal inferences).</td>
<td>Earthman &amp; Lemasters 2009</td>
<td>Working paper/Report</td>
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<td>Path analyses reveal a direct association between physical disorder and social disorder even when prior levels of collective efficacy are controlled. Further, there is evidence that the effects of physical disorder may be operating through increased fear and decreased collective efficacy to affect perceptions of threat/violence.</td>
<td>Plank, Bradshaw &amp; Young 2009</td>
<td>Peer-reviewed journal article</td>
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<td>There is a significant relationship between building condition and test scores. Additionally, at least 75% of principals indicated that the adequacy of the school facility impacted teacher attitudes, teacher recruitment and retention, student behavior, and parent and community attitudes and support.</td>
<td>Stevenson 2001</td>
<td>Working paper/Report</td>
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<td>Results based on multilevel logistic and linear regressions indicate that students are sensitive to schools' ambience and that the association of various aspects of the school's physical environment with students' problem behaviors is positive for all students and greater for 10th-grade students than for 8th- and 12th-grade students.</td>
<td>Kumar, O'Malley &amp; Johnston 2008</td>
<td>Peer-reviewed journal article</td>
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<td>Approximately one-third of schools indicated that there was at least one factor that interfered with their ability to deliver instruction to at least a moderate extent (32 percent with regard to permanent buildings, and 35 percent with regard to portable buildings. Across the 9 factors, 6-16% of schools reported that each factor interfered with instruction.</td>
<td>Cheney &amp; Lewis 2007</td>
<td>Working paper/Report</td>
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<td>higher suspension rates (2-9%), lower attendance rates in middle and high school (2-3%), lower test scores (~5%)</td>
<td>Boese &amp; Shaw 2005</td>
<td>Working paper/Report</td>
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<td>Changing from worst to best OCR leads on average to a 36 point increase in a school's API.</td>
<td>Buckley, Schneider &amp; Shang 2004</td>
<td>Working paper/Report</td>
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<td>4-9% difference between students in schools in worst/best condition; 5-9% difference between students in oldest/newest schools; 4% difference in graduation rates between students in schools in worst/best condition and between students in oldest/newest schools</td>
<td>Blincoe 2008</td>
<td>Dissertation</td>
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<td>No discernable relationship between test scores and building condition scores</td>
<td>Picus, Marion, Calvo &amp; Glenn 2005</td>
<td>Peer-reviewed journal article</td>
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<tr>
<td>The condition of school facilities has a measurable effect over and above socioeconomic conditions on student achievement and teacher experience/turnover. Most significantly, for every 10% reduction in the percent of portable facility sf/student, test scores increased by 11 points and for every 10% increase deferred maintenance average test scores decreased by 0.61 points.</td>
<td>Sheets 2009</td>
<td>Dissertation</td>
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<td>In schools with poor facilities students attended less days on average and therefore had lower grades in ELA and Math standardized tests. Attendance was found to be a full mediator for grades in ELA and a partial mediator for grades in Math.</td>
<td>Duran-Narucki 2008</td>
<td>Peer-reviewed journal article</td>
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<td>The quality of school infrastructure has a significant effect on school attendance and drop-out rates. Students are less likely to attend schools in need of structural repair, schools that use temporary structures, and schools that have understaffed janitorial services.</td>
<td>Branhm 2004</td>
<td>Peer-reviewed journal article</td>
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<td>Percentage of students passing SOLs was 2.2-3.9% higher in English, mathematics and science in standard buildings than it was in substandard buildings</td>
<td>Bullcock 2007</td>
<td>Dissertation</td>
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<td>Poor facilities affect the health and productivity (attendance) of teachers and make retention of teachers difficult (especially for schools with a condition grade of &quot;C&quot; or less). On the academic side, a shift from the best facilities to the worst decreases student test performance by ~3% (in DC this is for both math and reading, in Chicago for % of students performing at/above grade level).</td>
<td>Schneider 2003</td>
<td>Working paper/Report</td>
<td></td>
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<tr>
<td>Many positive correlations between building design variables and student achievement were reported</td>
<td>Hughes 2006</td>
<td>Dissertation</td>
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<td>Significant effects from found between high scores on all three design elements and test score results</td>
<td>Tanner 2009</td>
<td>Peer-reviewed journal article</td>
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<tr>
<td>Varying results - inconclusive or small positive results in early years, trending up to a peak of 1/6th of a school-level standard deviation six years after bond passage. (however point estimates fall back to zero after).</td>
<td>Cellini, Ferreira, &amp; Rothstein 2008</td>
<td>Working paper/Report</td>
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<tr>
<td>Results would predict an increase in NAEP scores of .236 points per additional dollar/pupil invested in infrastructure (based on a .236 structural coefficient across three years of NAEP scores).</td>
<td>Crampton 2009</td>
<td>Peer-reviewed journal article</td>
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</table>
Did you know that the nation’s 17,450 K-12 school districts spend more on energy than on computers and textbooks combined? Energy costs represent a typical school district’s second largest operating expense after salaries. Schools that have earned the ENERGY STAR — EPA’s mark of superior energy performance — cost 40 cents per square foot less to operate than average performers.

By being more energy efficient, schools can save money and improve student learning environments. EPA has found that a 10-percent reduction in energy use is often possible with little or no cost to building owners and managers. Schools that have earned the ENERGY STAR — EPA’s mark of superior energy performance — cost 40 cents per square foot less to operate than average performers. School districts can and have used the savings from improved energy performance to help pay for building improvements and other upgrades that enhance the learning environment. Studies have found that a better physical environment that includes superior energy performance contributes to increased learning and productivity. This, in turn, affects performance and achievement.

Energy efficiency also helps prevent greenhouse gas emissions from the burning of fossil fuels to produce energy. In fact, the buildings where we work, play and educate our children are responsible for almost half of the national emissions that contribute to global climate change. By being more energy efficient, schools act as leaders in the fight against climate change and teach students the importance of stewardship in protecting the environment.

Leveraging ENERGY STAR Resources for K-12 Schools
The American Recovery and Reinvestment Act of 2009 is a great opportunity for schools to go green, and using ENERGY STAR resources is an effective strategy for energy efficiency improvements. ENERGY STAR is the nation’s flagship energy efficiency program that helps us all save energy and money with tested and proven energy-efficient products and practices. Through ENERGY STAR, EPA provides the following no-cost tools and resources to help you identify areas for improving energy efficiency and develop a strategic energy management plan.

ENERGY STAR Guidelines for Energy Management
First, get started by applying EPA’s proven strategy to set performance goals, create and implement action plans, assess performance and progress and recognize your organization’s achievements. The ENERGY STAR Guidelines for Energy Management represent a systematic approach to energy management. By distilling the common elements of successful partners, EPA created the Guidelines to help other organizations adopt best practices for superior energy management. (See Fig. 1). Visit www.energystar.gov/guidelines for detailed, step-by-step directions.

Portfolio Manager
Next, use EPA’s Portfolio Manager to measure and track the energy and water use of your buildings. Portfolio Manager is a no-cost online energy management tool that enables you to identify the best opportunities for energy efficiency improvements, track progress over time, and verify savings results.
Once you’ve entered your energy consumption data into your Portfolio Manager account, you can identify under-performing buildings to target for energy efficiency improvements, as well as establish baselines to set goals and measure progress over time. As you continue to track key consumption, performance, and cost information in Portfolio Manager, you’ll be able to monitor energy efficiency improvements compared to your baseline, track reductions in greenhouse gas emissions, and view energy and water cost savings. Lastly, Portfolio Manager provides transparency and accountability to help demonstrate strategic use of capital improvement funding. Using Portfolio Manager, you can quickly and accurately demonstrate savings in energy use, greenhouse gas emissions and costs for an individual building or entire portfolio.

For schools and certain other space types, you can also compare your building’s energy performance against similar buildings nationwide using EPA’s 1-to-100 Energy Performance Scale. Your building is not compared to the other buildings entered into Portfolio Manager to determine your ENERGY STAR score. Instead, statistically representative models are used to compare your building against similar buildings from a national survey conducted by the Department of Energy’s Energy Information Administration, known as the Commercial Building Energy Consumption Survey (CBECS). A score of 75 indicates that your building, from an energy consumption standpoint, performs better than 75 percent of all similar buildings nationwide. Buildings that score 75 or higher may be eligible to earn the ENERGY STAR.

Get started benchmarking your buildings today at www.energystar.gov/benchmark.

Building Upgrade Manual

Once you’ve identified under-performing buildings to target for energy efficiency improvements, use the Building Upgrade Manual to help plan and implement profitable energy saving building upgrades. The Building Upgrade Manual features a 5-stage approach for building upgrades to maximize energy savings, including retrocommissioning, lighting, supplemental load reductions, air distribution systems and heating and cooling upgrades. The staged approach recommended by ENERGY STAR accounts for the interactions among all the energy flows in a building. Each stage includes changes that will affect the upgrades performed in subsequent stages, thus setting up the overall process for the greatest energy and cost savings possible.

The manual also features a chapter dedicated to best practices for K-12 schools and the aspects of building performance that are fundamental to providing an environment that is conducive to learning. This section explores upgrade choices that can cut energy consumption while also improving security and safety; indoor air quality; and, thermal, visual, and acoustic comfort. See www.energystar.gov/bldgmanual for more information.

Target Finder

In addition to helping you improve the energy performance of your existing schools, you can use
Target Finder to help ensure your new schools are designed to be energy efficient. Target Finder is a no-cost online tool that enables architects and building owners to set energy targets and receive an EPA energy performance score for projects during the design process. Projects that earn a score of 75 or higher are eligible for Designed to Earn the ENERGY STAR certification. Learn more at www.energystar.gov/targetfinder.

Training
In addition to these tools, ENERGY STAR offers free online training to help you improve the energy performance of your buildings. No travel, no lost time out of the office, and no cost—EPA makes it easy to get the information you need. View pre-recorded webinars or an animated presentation or sign up for a live Webinar with subject matter experts. Visit www.energystar.gov/businesstraining to view available sessions.

Success Stories
Among the thousands of K-12 partner organizations saving energy and money with ENERGY STAR, four leaders stand out. By using ENERGY STAR tools and resources to improve their energy efficiency, these school districts are shaping future leaders in the fight against climate change by not only teaching about saving energy, but living it every day in the classroom.

This spring, two school districts received the ENERGY STAR Award for Sustained Excellence, the most prestigious ENERGY STAR award, for exhibiting outstanding leadership and achievements year after year. Council Rock School District, located in Newtown, PA, has saved more than $2.4 million in energy costs in 2009 alone, for a total of more than $7.1 million in the past 4 years. The district was the first organization recognized by EPA as an ENERGY STAR Leader for reducing energy use across its building portfolio by more than 40 percent since 2005. Gresham-Barlow School District, located in Gresham, OR, has improved energy efficiency by more than 30 percent since 2003-2004 and has earned the ENERGY STAR label for all 19 of its schools.

Evergreen Public Schools, in Vancouver, WA, and Loudoun County Public Schools, in Ashburn, VA, have also been recognized as ENERGY STAR Partners of the Year for their exemplary energy management programs. Evergreen Public Schools reduced its energy use by 20 percent from a 2008-2009 baseline, saving energy costs equivalent to 14 teachers or almost 20 support staff members. Loudoun County Public Schools earned the ENERGY STAR for 24 of its buildings in 2009 and improved its portfolio-wide energy efficiency by 10 percent.

EPA provides recognition for all partners that demonstrate improvement in energy efficiency. Many K-12 school buildings are eligible to earn the ENERGY STAR for superior energy performance. Districts that increase their building portfolio’s energy efficiency by 10 percent or more are eligible to receive ENERGY STAR Leaders recognition, and those that achieve a rating of 75 or more across their entire portfolio can earn Leaders Top Performer status. As previously discussed, the ENERGY STAR Partner of the Year Award is given to those districts that demonstrate exceptional achievement and commitment to increasing energy efficiency and fighting global climate change.

Get Started Today!
By using ENERGY STAR tools and resources, these schools are cutting energy use, saving taxpayer money and preventing greenhouse gas emissions that contribute to global climate change—and you can too! Get started today by visiting www.energystar.gov/k-12 and joining as an ENERGY STAR partner.

Caterina (Katy) Hatcher
Caterina (Katy) Hatcher is the US EPA’s ENERGY STAR Public Sector National Manager. Katy works with public sector organizations, such as schools, governments and water/wastewater utilities, to help them improve their energy performance through the use of ENERGY STAR tools and resources. Katy has been working for EPA for more than 13 years. She holds a degree from the University of Virginia’s School of Architecture in City Planning.
Schools and Energy:
(Some of) the Facts
Buildings use 39% of the total energy and 70% of all electricity in the United States. For school districts, energy is about 6% of the total district budget – roughly equal to the cost of all textbooks. With many buildings and one comprehensive approach, school districts have a unique opportunity to make small changes in their energy consumption behavior to make a big impact and save money.

For example, lighting accounts for about 37% of a school’s budget and is responsible for 20-25% of the electricity used by an individual school. Surveys of electricity use in schools show that school corridor lighting is by far the largest consumer of electricity in a school facility – accounting for about 8,770 hours of use as compared to just over 2,000 hours in the classrooms. Reducing corridor lighting by 20-25% (one lamp in a four lamp fixture) saves 25% of the lighting costs for corridors and is virtually undetectable to the human eye.

Plan for Energy Savings
These days, who doesn’t want to be “green”? You can show that you are a good steward of ALL the green stuff - the earth and your taxpayer’s money. Schools can model green technologies and responsible energy conscious behavior effectively and on a large enough scale to really make a difference. Finally, staff and students benefit from increased daylighting (linked to higher test scores), better indoor air quality and more money for other programs.

Creating an Energy Conservation Plan is a great first step toward long term energy savings. A good plan has five basic parts: goals/policy, objectives, assessments, recommendations and implementation.

When setting your initial goals and policies, make sure to be realistic. Balance time, people and money. No matter how good a plan is, it won’t go anywhere if you can’t achieve it.

Objectives are HOW you intend to reach your goals. They are the steps you intend to take to get there and should be measurable. Establishing a baseline of energy consumption for each facility over a period of time will help you understand how each school is performing now. Describe your energy conservation measures based on facts, not feelings.

Assessing each facility means getting out and making a physical examination of each building. It is important to look at the big picture: site orientation; building envelope; windows and doors; equipment; lighting, water and gas use. The Environmental Protection Agency’s ENERGY STAR Program offers a free application called “Portfolio Manager” to help you track energy and water consumption, identify under-performing buildings, set priorities, monitor progress and verify improvements. Some states, corporations and energy companies will also help with energy audits free of charge. Some schools have also used their earth science classes to help out with monitoring.

Recommendations for Energy Conservation Measures (ECMs) should be specific and evaluated by savings, initial cost and payback period. A good ECM should show a payback of eight years or less unless part of a longer term strategy. Longer term strategies such as whole system replacements, solar, wind and geothermal should be included in the study for comparison. Sometimes minor improve-
ments provide more savings and sooner.

Implementation plans should be specific and achievable. They should be monitored regularly to keep improvements on track.

Performance Contracting and Sustainable Energy Programs

Recent government incentives in sustainable and energy efficiency programs can be a boon to schools. The Department of Energy, federal and state agencies, as well as numerous non-profits are providing incentives for the installation of solar, wind and geothermal technologies.

States such as Arizona have passed laws allowing school districts to enter into performance contracts with third party companies in order to take advantage of the massive grant rebates and credits from the state and local energy companies. At Scottsdale Unified School District, solar photo-voltaic systems have been installed at no cost to the district. The third party provider installs, maintains and operates the system at a fixed utility cost for a period of time, at the end of which the district will own the equipment and be able to provide a portion of its own electricity through solar power.

The Little Things Count: Magic Energy Strategies at Little or No Cost

Budgets are tight and school maintenance always seems to get cut first. Here are a few low or no cost strategies that will help you save big:

• Don’t Idle! Turn off the bus and you’ll save over $22K in a fleet of 100 buses
• Turn off lights in unoccupied hours by linking them to your security alarm and save 12-20% energy
• De-lamp areas with excessive lighting (ex: remove the 4th lamp from a 4 lamp fixture) and save 25%, you can dim light by up to 80% and the human eye will not perceive it.
• Provide inside and outside switching
• Change exit signs to Light Emitting Diode (LED) and save 5-10% energy
• Change T12 fixtures to T8 and save 20% of lighting energy
• Tuning up your HVAC systems will save 10%; upgrade components for maximum efficiency
• Close outside dampers when the space is unoccupied
• Do the following for highest Return on Investment (in order of highest return for shortest time)
  o System tune up
  o Lighting efficiency upgrades
  o Energy load reductions
  o Fan and motor systems repair and upgrade
  o Plant upgrades
• Limit afterschool activities to as few heating/cooling zones and turn off the rest of the building (save 25%)
• Do not block air flow to HVAC vents to allow efficient operation (up to 10% of heating/cooling costs)
• Close doors and windows while system is running (1-25% savings)
• Set cooling to 78-80 degrees and 85 degrees unoccupied
• Set heating to 68-72 degrees
• Put timers on electric water heaters and vending machines

You don’t need flashy and expensive technologies to create significant savings. Sometimes the little things add up.

Molly Smith, AICP, REFP

Molly Smith, AICP, REFP is a nationally-recognized authority on all aspects of K-12 planning, working with school districts across the country for over 18 years. Her consulting firm, thinkSMART planning, inc. is committed to the creation of learning environments that support the latest thinking in teaching and learning. She has addressed numerous practitioner-based audiences at national educational conventions and has written extensively on school planning techniques and school facilities’ connection to student improvement.

Visit the thinkSMART sponsored blog, SMART thinking! — www.thinksma plan.com/wordpress

Dr. David Peterson

Dr. David Peterson began his career with Scottsdale Unified School District in July of 2005 as Chief of Facilities Management for Learners. He was appointed Assistant Superintendent for Operations in February, 2007. A native of Minnesota, he holds a Juris Doctorate from Concord School of Law, and is a member of the California State Bar. He also holds a Certificate of Business Management from Central Arizona College, a Certificate of Public Schools Planning and Design from Harvard University, an MSE Civil Engineering and a Hazardous Materials Waste Management Certificate from Arizona State University, and a B.S. in Engineering from the U.S. Naval Academy.

Dr. Peterson previously served as the Director of Operations at the Mesa Unified Public School District and was with Mesa Public Schools for ten years. He was Vice President for Estimating/Project Management/Engineering at Summa Mechanical Contractors, and an Intelligence Officer with the U.S. Air Force.
Lean, Mean and Green
An Affordable Net Zero School

By Kenneth Stanfield

From its conception, Richardsville Elementary was designed to be an affordable net zero facility. The design team explored numerous energy saving strategies to dramatically reduce energy consumption. By reducing energy use to 19.31 kBtus annually, the net zero goal could be realized through the implementation of a solar array capable of producing enough energy to meet the school’s operating demands. Coupled with the goal of a LEED certified facility, the building’s components were identified and implemented to affordably attain a facility that demonstrates a sustainable site, net zero energy, water efficiency, materials and resources conservation, and an indoor/outdoor environment that promotes a healthy, progressive learning atmosphere while reducing life cycle maintenance costs and zeroing out electricity costs.

What is a “net zero” building?

By definition, a “net zero” or “zero energy building” (ZEB) uses the same amount of energy, measured annually, as it produces using on-site renewable energy sources – i.e. it generates as much energy as it consumes. Any building – existing or new – can achieve net zero by harnessing sufficient renewable energy sources, like solar panels or wind turbines, that collectively offset the building’s annual energy consumption.

The issue is that energy derived from renewable sources today is not necessarily considered “cheap energy,” or typically not nearly as cost competitive as energy pulled from the fossil-fueled grid. For example, while advances in technology have led to some remarkable increases in the performance and efficiency of solar panels, it still requires, even with government incentives, a significant investment from an owner, resulting in lengthy payback schedules.
Can a school afford to “go zero”?

In planning a net zero building, the renewable energy really is the easy part. The real challenge, and significant achievement, is to profoundly reduce the energy consumption of the building through its design and operation. This in turn reduces the renewable energy required, resulting in a reduced investment and shorter payback.

Those in the school business – boards of education or administrators, architects or engineers – understand the complexities and constraints of school finance and limited construction spending.

So the question is: Can a school facility – a building that includes a gymnasium, library, kitchen, cafeteria and classrooms – be designed to reduce energy significantly enough that a typical public school district can afford to “go net zero”?

To answer that question, one must first determine to what level energy consumption can be reduced without sacrificing human comfort and a healthy learning environment. In Kentucky, the average school building consumes 73 kBtus of energy per square foot annually.

Scheduled to open in August, 2010, as a net zero school, Richardsville Elementary, is designed and modeled to consume 19.31 kBtus per square foot per year. That’s 73% more efficient than the average school. The 77,466 square foot building bid in December 2008, at a total construction cost, including site development of $12,160,000.00, or $156.97 per square foot. The solar panel array – consisting of a 207kw roof-applied amorphous thin film system and a 139kw mono-crystalline shade structure in the parking lot – was bid separately, for an additional cost of $2,753,124.00.

With the solar panels included, the total per square foot cost for construction was $195.50. At the time of bid, the Kentucky Department of Education was estimating the cost of a typical elementary school at $203.00 per square foot – “typical” being a 73 kBtu, non-LEED certified building with the same program requirements as Richardsville.

What are the design strategies for a “net zero” school?

At the beginning, the design team, lead by Sherman Carter Barnhart Architects and CMTA Engineering, working together with the Warren County Board of Education, identified three essential goals for Richardsville to be a net zero school: To reduce energy – “go lean”; to implement a strict operations and maintenance plan – “get mean”; and achieve LEED certification – “go green”.

Can a school afford to “go zero”?
Going “lean” to reduce energy consumption –
HIGH PERFORMANCE BUILDING ENVELOPE/SITE ORIENTATION

The high performance envelope began with a compact design, both in plan and volume. The reduced perimeter wall characteristic of the resulting plan aided in reducing HVAC load. This load was further reduced by: eliminating attic space; situating the high bay areas of the building – the gymnasium, cafeteria, and media center – in the center of the “doughnut” plan; and incorporating the heat pumps in mechanical closets between classrooms. This in turn reduced the first cost of the building shell, “shifting” construction dollars to pay for the more expensive, yet more efficient, geothermal system.

Super insulated ICF walls and an R-32 roof provide an efficient building envelope, requiring much less energy to heat and cool the facility. And, due to the efficiency of the building envelope, the heat pumps were downsized. The building is oriented north-south to optimize the classroom daylighting strategies and maximize the electrical output of the roof mounted solar panels.

GEOTHERMAL HVAC/MONITORING CONTROLS

A geothermal heating and cooling system, coupled with a distributive pumping strategy, will reduce the building’s energy consumption and reduce the area needed for the mechanical spaces. In addition, several geothermal units in the facility will be used solely for hot water generation, eliminating the need for water heaters. Occupancy and motion sensors, as well as CO2 monitoring, maintain an optimum learning environment and reduce the system’s power demands.

TECHNOLOGY

The use of wireless computer technology will reduce plug load and aid in the efficiency and performance of the building. This wireless technology helps reduce the building’s footprint and overall area by eliminating a computer lab from the school’s program. Any space, indoor or outdoor, can be utilized for laptop computers, thus saving an estimated 1000 square feet. The benefits extend beyond not having to condition the extra space. The use of laptops in lieu of large desktop computers further decreases energy use and the additional cooling loads associated with the internal heat gains from numerous desktop units.

Getting “mean” with operations management –
OPERATIONS AND MAINTENANCE PLAN

During the development of the operations manual, a plan for building security, after-hours use, and maintenance was implemented. Environmentally friendly “green” finishes such as soy-based stained concrete and porcelain pavers reduce maintenance labor and secondary energy consumption.

As a testament to the school district’s commitment to energy-reducing policies, it should be noted that a school principal’s evaluation in Warren County includes a component for measuring the operational efficiency of their facility against a district baseline. This policy makes building administrators aware of the importance placed on efficient operations, and includes them in leading the cause to save energy.

EFFICIENT KITCHEN STRATEGIES

The kitchen energy management strategy involves several areas of concentration. First, using ENERGY STAR-rated equipment helps reduce energy consumption. Second, by employing combi-ovens in lieu of fryers and tilting skillets, eliminating the Class I hood necessary for grease-laden vapors, make-up air will be significantly reduced or possibly eliminated. Moreover, the combi-ovens provide a healthier cooking alternative, improving the nutritional quality of the school meal plan.

Preparing and implementing an energy-conscious business operations strategy for the kitchen will further aid in energy conservation.

Going “green” to achieve LEED certification –
DAYLIGHTING SYSTEMS

All classrooms utilize daylighting principles to achieve LEED credits. The windows specified on the project are oriented to face north/south. They have been individually analyzed and modeled to converge on insulating and tinting requirements so that glare and direct beam light is controlled. The energy needed to counteract heat gains is minimized while the lighting for the classroom environment is properly provided. Light fixtures in classrooms have automated daylight dimming controls, and it is anticipated that the fixtures will be off during 70% of the school hours.

Exterior light shelves on south facing walls reflect light into the classroom, eliminating direct beam light and thereby making the environment comfortable to occupants, decreasing the need for additional cooling loads. Interior light shelves are used to reduce glare. The classrooms on the north side of the building have roof-mounted “solar tubes” that spread light into the classrooms through vertical chases. A central “spine” light monitor harvests daylight and distributes it into the high volume spaces of the gymnasium, cafeteria, and media center.

ALTERNATE RENEWABLE ENERGY SOURCE

The solar photovoltaic (PV) system at Richmondville Elementary is grid-tied, using energy from the utility grid when on-site generation is inadequate. During periods of low demand, such as after school, weekends or summer, electrical power is returned to the grid, providing an alternate fuel source to the area.

The PV system is comprised of a 207 kW roof applied amorphous thin-film system and a 139 kW mono-crystalline shade structure in the parking area. These technologies were selected for their high-energy production relative to costs. Mono-crystalline systems are mounted at an optimum angle to the sun using a steel structure engineered for the high wind forces and specified to contain a high recycled content. The amorphous thin-film system was selected for the roof due to its inherent ability to operate efficiently on the near flat roof surface. The electrical output from the PV field is a direct current (DC), similar to a battery, but the electrical systems in the building are designed for three phase alternating currents (AC). Two (2) 95% energy efficient inverters are used at the school to convert the DC input from the PV panels to an AC output. In addition to using efficient inverters, the wiring and connection systems have been designed to minimize transmission losses and allow maintenance.

BUILDING AS A TEACHING TOOL

The facility will involve students in monitoring the performance of the net zero design, earning “Innovation” LEED points and teaching environmental stewardship to future generations. A “geothermal hallway” exposes the piping manifolds and equips the pipes coming to and from the well field with a temperature gauge, so students can monitor the performance of the system. The “solar hallway” has a battery charging station where students can see the energy transferred from the solar panels to the laptop computer batteries. The “water conservation hallway” allows students to monitor the amount of rainwater collected and filtered through the site’s bioswales. The “recycling hallway” provides bins for all recyclable products and allows students to monitor the quantities of materials collected. Outside, a compact weather station gathers information 24/7, enabling students and teachers to evaluate the building’s performance throughout Kentucky’s four distinct seasons.
From its conception, Richardsville Elementary was designed to be an affordable net zero facility. The design team explored numerous energy saving strategies to dramatically reduce energy consumption. By reducing energy use to 19.31 kBtus annually, the net zero goal could be realized through the implementation of a solar array capable of producing enough energy to meet the school’s operating demands. Coupled with the goal of a LEED certified facility, the building’s components were identified and implemented to affordably attain a facility that demonstrates a sustainable site, net zero energy, water efficiency, materials and resources conservation, and an indoor/outdoor environment that promotes a healthy, progressive learning atmosphere while reducing life cycle maintenance costs and zeroing out electricity costs.

Kenny Stanfield AIA, LEED® AP
Principal

Kenny Stanfield is a registered architect, LEED® Accredited Professional, and principal at Sherman Carter Barnhart Architects, a leading architectural, engineering, and landscape design firm based in Lexington, Kentucky.

A school design veteran, Kenny now heads the education studio at the Louisville, Kentucky, office of Sherman Carter Barnhart, and leads the firm’s efforts in green and sustainable school design.
Student Learning Centre (SLC) Embraces the New Melbourne Model of Teaching: Facilitating Collaborative Learning

By Sarah Ball

Learning is about discovery and change. As schools and universities look to the future, it is fundamental that they provide environments that facilitate collaborative learning and act as points for interaction and social activity.

The new Student Learning Centre will be about creating the Melbourne on-campus experience – the learning, social interaction, the life and centre of the Engineering Faculty. The Student Learning Centre will reinforce the faculty’s commitment to providing progressive, dynamic and innovative environments. It will foster the idea of a community of learners and celebrate the tradition and excellence of the Engineering Faculty.

The School of Engineering at the University of Melbourne has for many years delivered its teaching in a traditional university mode. Feedback from industry employers indicated that University of Melbourne students are well educated in engineering principles and techniques but are less aware of skills required in large corporate organizations. In 2007, the School of Engineering determined that it would re-invent its teaching program and its learning environments to develop these skills. Not only will students learn about engineering analytical processes at a very high standard but also develop communication, presentation, teamwork and collaboration skills.

This coincided with the initiation of the new University-wide under-
graduate curriculum that offers students in the early stage of their university course greater opportunities for choice in subject selection. The Melbourne Model is a three year undergraduate degree followed by a two year Master’s program. The initial years of the degree allow students to experience different disciplines before deciding on their choice of Master’s degree. Rather than teaching by direction, the emphasis is on learning by discovery and sampling through breadth of subject material before focusing on depth of subject content. The pedagogy change focused on group based learning and the traditional teaching environment had to change to accommodate this.

The redevelopment of the existing Engineering Library into a Student Learning Centre (SLC) embraces the new Melbourne Model of teaching: facilitating collaborative learning while acting as a point for interaction and social activity. The challenges we faced in this project included working within an existing building, making the most of a limited budget and aligning the space with new teaching and learning pedagogy.

Learning is about discovery and change -- learning spaces must support this process. The SLC provides a number of formal and informal spaces that respond to the pedagogical shift, creating an innovative adaptable environment.

The SLC is for first year engineering students with two new adaptable classrooms as key attractions to the centre, while the varied supporting group study areas provide students with a place to gather, share knowledge and ideas beyond the formal teaching hours or to simply chill out. The aim was to avoid typical institutional design and instead draw inspiration from places students often study or hang out – kitchen table, lounge room, study, library, cafes and bars.

The interiors are formed by the elegant existing Old Engineering Building; the façade is of heritage significance. The interiors have been stripped back to its original envelope and linings. The quirky and antiquated character has been retained and celebrated as a home away from home for students. The existing fireplace evokes a sitting room while the small skylight corridor is transformed into an outdoor courtyard environment. The large open column free space is based on an open plan warehouse fit-out, containing the notion of dining, kitchen, lounge and formal meeting space. The furniture language is semi-industrial, timeless and could easily become a city alleyway bar. In a symmetrical more private study area, the reference is a more traditional library setting, both dark and formal, attracting a quiet group or individual study.

Classroom

The two pivotal classroom settings are key attractions to the Student Learning Centre. These formal classroom settings are designed to support collaborative learning approaches.

Each classroom accommodates classes of 60 students. The collabora-
tive learning approaches involve students in learning activities within small to medium sized groups as well as individually. Specially designed tables accommodate two computers to allow for students to work in groups of three.

The classroom setting supports a one-to-many presentation style approach, which may involve either the teacher or a student as the presenter. Student movement around the room is facilitated to enable exchange and interaction between groups, as well as the reconstitution of groups during a class. The design of the ‘desks’ and the integrated IT allows students to ‘share’ and ‘distribute’ their work in progress or completed material with other groups within the class.

At the same time the classroom is more than just an IT-intensive space. It needs to be a place for discussion, print-based activity and possibly the development of some form of ‘hands-on’ skills. This is an environment where ‘communication’ and ‘presentation’ skills are likely to be practiced and highlighted. To allow for this, the ‘desks’ are designed in such a manner so that the computer screens can be moved to the side to allow for groups of six to also work across the tables.

A central teacher table is very different from the traditional teacher ‘stand-and-deliver’ approach from the front of the class. The design allows for teaching staff to move freely from group to group engaging students in their specific concerns and problems.

Importantly, the classroom setting is available to students beyond time-tabled hours.

**Informal Student Lounge**

This area provides students with opportunities to gather and interact in a variety of settings and encourages the continuation of the “learning conversation” beyond the classroom. The lounge supports informal, group-based learning activity, and the blurring between study and
social interaction which also binds the group. This setting draws upon the idea of the spaces in which students may study at home - the dining table, kitchen bench and lounge. It is important that in combination, the student lounge provides a diversity of seating and working space options for students.

The furniture is also akin to many of the cafés and bars where students spend their time out of uni hours. The arrangement of the study lounge enables ‘separation’ between groups while avoiding ‘segregation’ from the wider group. Visual contact across the whole room is a priority so that all feel part of the whole group.

The Nook

The nook is located off the student lounge and provides a place where groups can prepare and practice presentations and other group-based assessment tasks. The LCD screen allows student to connect their laptop and present their work to the group.

The Garden

The garden is a little space between the lounge and the study, filled with natural light from skylights above and the arched window. Outdoor furniture is suitable for individuals or groups to read, chat or study with modern grass under their feet.

The Study

This space draws on the idea of the den, the study, and old world libraries. Darker and moodier tones set the scene that this is a quieter study area. Here students will find tables and chairs to accommodate small groups of around 5-6 students. They can spread a range of material across the table as they collaborate on joint activities.

Ante Room

Located outside the first floor classroom, the ante room is a space
set aside for social interaction where students can sit in large arm chairs and talk, or where they can meet before or after class. There are no formal study facilities in this space; it is much more a ‘retreat’ space.

The Student Learning Centre, with its variety of learning and working spaces has created an active collaborative learning centre and is a working example as to why such spaces are a valid part of the University Campus. The spaces support students in the skills of teamwork, problem solving and communication which are necessary to be “work ready.” The School of Engineering, through the Woods Bagot design of the space, has led the way at the University of Melbourne in the development of these facilities and the new spaces created within a traditional old building at the heart of the engineering precinct are envied by students across the University and admired by universities around the world.

Sarah Ball
Principal
Woods Bagot

Sarah Ball is a Woods Bagot Principal and a leader in the Education & Science Sector with extensive experience in both Australia and overseas in the development of new sustainable learning environments. She is committed to design quality and is engaged in all aspects of the design process including early investigative work, master planning, initial strategic concepts and planning, schematic and detailed design through to implementation.

Sarah is a registered Architect (Victoria, Australia) and her experience includes three years in the UK working on various independent academy schools and Building Schools for the Future projects. Since joining Woods Bagot she has led several major education projects including the Perth Modern School Redevelopment, Zayed University Library, Albert Park Secondary College, Berwick Select Entry School and the CEFPI Award winning University of Melbourne, Engineering Faculty Student Learning Centre.
In September 2009, the American Institute of Architecture’s Committee on Architecture for Education (CAE) held their annual fall conference in Helsinki, Finland. Finland was a beautiful place to gather. Cool, crisp air, a stunning natural setting, great architecture and a city that offers a blend of new and old. It was very inspiring, and that’s what the conference was all about, inspiration. Finland has long been a major presence in international architecture circles. From Alvar Aalto to today’s new generation of creative Finnish designers, excellence in architectural creativity has its roots in this part of the world. School design continues to be a major part of this history of unique problem solving.

We were in Helsinki because several international studies, including the OECD Program for International Student Assessment, had rated Finland among the world’s best in student achievement. It is argued that Finland’s exemplary performance is largely due to the country’s main principles for comprehensive education: equal opportunity; regional accessibility; education totally free of charge; a supportive and flexible administration; individual support for the student learning and welfare; development-oriented evaluation and student assessments – no testing or ranking lists; highly qualified teachers; and quality learning environments. This stands in sharp contrast to much of the educational system in the United States where students are for the most part being educated for the 21st century in 20th century industrial-model. Further,
our schools run on a 19th century agrarian calendar schedule.

As the world becomes flatter it is imperative that we look at the best models for learning environments wherever they may be. The conference focused on two main ideas: 1) a chance to experience, first-hand, current trends in school design that have an influence worldwide and 2) what attendees could take away from the conference that would help them improve their own practice.

The annual fall conference explored, in detail, the roots of Finnish educational design. New and innovative designs influencing today’s learning facilities everywhere were showcased. The conference included informative programs and great tours – in fact, the three day conference was a continuous tour, with each program taking place at a different school or learning environment.

Because learning occurs in a wide variety of spaces beyond the typical school house, the conference included higher ed facilities and public learning facilities such as the new Karisma Museum by Steven Holl, the new campus library at the University of Helsinki and other unique learning environments. Supporting the theme “global perspectives,” presentations from countries around the world complemented the projects in Helsinki.

All seven continents were represented to help illustrate the notion that learning in a flat world has always generated, and continues to generate, the same daily issues, concerns, constraints, and lifelong learning opportunities. Whether it’s a one room school in Kenya, a community-built school house in Laos, a constantly evolving structure on the frozen tundra of the North Pole or a comprehensive high school for 2400 students and a community center for a city of 140,000 in America. School facilities worldwide are creating lifelong learners who become productive citizens within their communities.

The keynote speaker was Yong Zhao, Ph.D. He is a University Distinguished Professor in the Department of Counseling, Educational Psychology, and Special Education at the Michigan State University College of Education. Dr. Zhao is the Founding Director of the Center for Teaching and Technology, as well as the Director of the US-China Center for Research.
on Educational Excellence. In addition, Dr. Zhao is an Associate Director of the International Network for Educational Transformation, a U.K. based organization that promotes global exchanges of educational innovations. The first session was held in the Karisma Museum designed by Steven Holl. The presentation focused on the future of educational teaching and the ways the physical facility plays a role.

Session 2 was at the well known Russutorppa School. Here the group heard from Riitta Lampola and Kaisa Nuikkinen, arkit SAFA. The topic of discussion at this session was “The Finnish School System” and “Visions of the Helsinki City School Bidding Program.” The Helsinki City Education Department develops school buildings which strive to function more effectively and to anticipate the demands of the future. Their school buildings are designed to be economically viable and to provide the highest quality of architecture. As part of the “Quality School Program”, the City of Helsinki has constructed over 40 new school buildings from 1994 to 2005.

Session 3 was a continuation of the Helsinki School System. This session was at the internationally known Hösmärinpuiu School. Here the group heard from Dr. Ulrike Altenmüller, Dr.-Ing (designa-ti). She focused on the influence of the built environment on human well-being and performance. Various studies examined contemporary school buildings in Finland and analyzed the spatial, functional and design concepts of these buildings. A variety of parameters that have significantly influenced the learning environment presented.

For session 4, the group was invited to the British Ambassador to Finland’s residence. Here D. Valerie Caton, Ty Goddard, and David Carter presented “United Kingdom, Building Schools for the Future Programme”. Design versus learning, actual case studies, and numerous presentations regarding prototype design were presented.

At the Sandals School the group heard from Sarah Woodhead, AIA, Sr. Project Manager / CDM International, Inc., and David Young, Young Architects Ltd.

Sarah is leading CDM’s program to build 28 new schools and rehabilitate up to 100 schools throughout the Kingdom of Jordan. Sarah has had a leadership role in the design and construction of schools, serving at various times as advocate, architect, state regulator, and public program manager. She presented high quality design work and construction programs that are both visionary and responsive to community needs, including school design and construction, design standards for science facilities, sustainable design and program management. In
her role as Chief of Party in Amman, Jordan, Sarah is able to combine a dedication to exemplary school design with a long standing interest in Middle Eastern language, culture, history, and architecture.

David Young is a principal of Young Architects (Pty) Ltd in Botswana, South Africa. His career began with the Ministry of Works in South Africa and in 1979 moved to employment in Botswana. While David has worked on a variety of projects in Botswana, the focus of his practice has been educational projects. David has also developed skills in working with free and open-source web software.

A combined Tour of four different school facilities provided a break in the presentations. The Arabia School, Pukinmäki School, Hiidenkivi School and the Metsola School are four very distinctive and different examples of the Helsinki school system. The architect of each school gave a brief overview prior to the tours.

At the Aurinkolahti School Rodolfo Almeida, architect, provided a presentation on Latin American School Facilities. Project locations included Mexico, Brazil, Chile, and the Caribbean. Annalise Gehling, with Fielding/Nair International, gave us insight into new design paradigms in Australia. New and exciting concepts in collaborative learning were presented.

The Teacher Training School at the University of Helsinki provided the venue for Greg Hasiuk, Number TEN Architects, Canada, to present a case study of a new school in the Northwest Territories, just miles from the North Pole. His presentation focused on specific community cultures and how they affect design and influence learning.

Daniel Schwitter, SKAT, presented a variety of projects that improved community involvement and increased educational opportunities that including design, planning, and construction of public works projects for health, educational, and sports facilities in Afghanistan, Bhutan, Cameroon, Cuba, India, Kyrgyzstan, Laos, Philippines, South Africa, and Switzerland. Over the past 25 years, he has designed and managed large-scale health and school building projects, as well as housing projects in Asia and Africa. His presentation also focused on projects throughout Laos.

At the final session Kevin King, AIA, LEED, presented a master planned college campus for 100,000 students. Additionally, a collaborative effort with Professor Aija Stefans, D. Sc., Architect, Dr. Axel Haberer, and Dr. Dieter Breithecker provided insight into how furniture and ergonomics affect learning. The InnoSchool project was the focus of this presentation. The goal of InnoSchool is to develop the Future School Concept: a set of research-based good practices, processes, models and designs, as well as recommendations for the successful combination of these elements in the Future School.

This final session was held at the Korona Information Center library. A tour of this latest library learning center offered a first-hand look at the thought, insight, conceptual planning, and future idea’s regarding tomorrow’s educational facilities and how they will advance learning.

Steve Crane
VCBO

Steve Crane, FAIA, has provided professional architectural design and planning services on a wide variety of projects for nearly four decades. A founding partner with VCBO Architecture, Steve leads the firm’s work on educational and library architecture, for which he and VCBO have earned national, regional and local honors. Nearly half of the firm’s work is pre-school to higher education projects, both public and private, totaling over $150 million per year. Steve strives to create schools that are versatile, contain multiple-use spaces, and facilitate the changing ways that subjects are taught over time. Recognized as an authority on the effects of the Built Environment on learning, he was asked by the White House to represent the AIA on CNN live and has been quoted in Newsweek magazine.
US EPA
BOOST
STUDENT
PERFORMANCE AND
PRODUCTIVITY IN
YOUR SCHOOL!

Improving Indoor Air Quality and Academic Performance — Facility Maintenance is the Cornerstone
Wednesday, August 18, 2010
12:00 – 1:30 pm EDT

The IAQ Tools for Schools Program is a comprehensive resource to help schools maintain a healthy environment in school buildings by identifying, correcting, and preventing IAQ problems. Learn more about the IAQ Tools for Schools Program at http://www.epa.gov/iaq/schools.

This webinar will focus on the impact of indoor air quality on student health and academic performance, allowing you to gain insight on ways to identify, address and prevent IAQ problems in your school buildings. The webinar will address the importance of using a maintenance management system and present guidelines and proven methodologies including training, reporting and leveraging technology.

This webinar is offered at no cost to participants. Don’t miss your chance!


Should you have any questions about this webinar or the registration process, please contact the IAQ Tools for Schools Connector Coordinator at IAQTfSConnector@cadmusgroup.com.

US EPA
ENERGY STAR
ONLINE
TRAINING SESSIONS

Learn how to improve the energy efficiency of your school buildings by 10 percent or more.

ENERGY STAR and Green Building Rating Systems
Wednesday, August 25, 2010
Thursday, September 16, 2010
2:00 – 3:30 pm EDT

During this session, attendees will learn how to use EPA tools and resources to help meet requirements for green building rating systems such as the U.S. Green Building Council’s Leadership in Energy and Environmental Design (LEED), the Green Globes system, California High Performance Schools (CHPS) and others. Discover how ENERGY STAR tools and resources work together with these systems to address building energy performance, both for new and existing facilities.

K-12 Benchmarking 101 using EPA’s Portfolio Manager tool
Wednesday, August 18, 2010
Wednesday, September 29, 2010
2:00 – 3:00 pm EDT

Your building can be an ENERGY STAR-rated school! Learn the basics of benchmarking your K-12 buildings using EPA’s Portfolio Manager tool. Portfolio Manager can help measure and track energy and water use across an entire portfolio of buildings and identify weak links in energy performance. Buildings can earn an energy performance rating as compared to peer facilities across the country, and top performing buildings are eligible for national recognition.

Register now at https://energystar.webex.com Learn more about ENERGY STAR for public sector organizations at www.energystar.gov/government
ENERGY SAVINGS

Glazed areas in walls and roofs are the single largest source of wasted energy! Kalwall eliminates waste. Whether for retrofit or new construction – there is no other light-transmitting material that is so highly insulating... permanently.

BEFORE... aging school windows are high maintenance, inefficient and undesirable.

DURING... installation can even take place with classes in session. Factory pre-assembled.

SUPER-INSULATING, LIGHT-TRANSMITTING material that slashes energy loss.

Glass vs. Kalwall

It’s clear to see: Kalwall outperforms glass with energy savings that deliver a rapid payback and create a better place to learn. Healthy, glare-free daylight.

<table>
<thead>
<tr>
<th>Kalwall U-value Examples</th>
<th>Savings by Kalwall vs. Single Glass “U” = 1.10</th>
<th>Savings by Kalwall vs. Double Glass “U” = 0.50</th>
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<tbody>
<tr>
<td>0.29 (R-3)</td>
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<td>0.10 (R-10)</td>
<td>91%</td>
<td>82%</td>
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AFTER... The HVAC payback is rapid. A revitalized school is a better and healthier place to learn.

- HVAC and electric light savings year-round
- Vastly improves insulation qualities
- U-values as low as .05 (R-20)
- Controls condensation • Glare-free daylight
- Safety & security • Shatterproof
- Vandal-resistant • LEED® • Green

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Kalwall Corporation, PO Box 237, Manchester, NH 03105 - 800-258-9777 (N. America)
Design Firms Can Claim Federal Tax Incentives for Energy-Efficient School Buildings

Up to $1.80 SF for energy-efficient lighting, HVAC and envelope.

Architects, engineers and other designers can claim federal tax deductions for certain energy-efficient features in public schools, public universities and other public buildings that meet EPACT §179D criteria.

Deduction Examples:

<table>
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<tr>
<th>Property</th>
<th>Qualifying Area</th>
<th>Qualifying System</th>
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Our dedicated §179D team includes licensed engineers, appraisers, architects, CPAs and construction managers, many of whom are LEED Accredited Professionals.