

Collaborative for High Performance Schools (CHPS): The Process of Mainstreaming Efficiency in Action and the Evolution of CHPS

Haile Bucaneg, California Energy Commission

ABSTRACT

The Collaborative for High Performance Schools (CHPS) represents a successful example of mainstreaming a high performance building criteria throughout the California school system. CHPS is currently working to mainstream high performance building criteria on a national level.

The CHPS organization began in 1999, when the California Energy Commission called together the investor owned utilities to discuss ways to improve the performance of California's schools. Out of this partnership, CHPS grew to include a diverse range of government, utility, school districts, design professionals, and non-profit organizations committed to promoting the development of high performance schools. To meet this goal CHPS developed new school construction and major modernization guidelines represented in Best Practices Manuals, and the CHPS Criteria. The CHPS Criteria defines high performance attributes in the categories of energy, water, sustainable sites, materials, indoor environmental quality, and policy and operations.

Adoption of the CHPS Criteria in California schools has shown remarkable growth. Initially, several demonstration schools were built to assess benefits of using the CHPS Criteria. These projects led to over 100 schools built to or planned using the CHPS Criteria in California. Additionally, 27 school districts have adopted district wide resolutions requiring all future school buildings utilize the CHPS Criteria. Participating districts include Los Angeles Unified School District, the second largest school district in the country.

Benefits of the CHPS Criteria are reaching across state borders. Currently seven states have adopted the CHPS Criteria, or variations tailored for regional needs. Momentum continues to build with the development of a National CHPS organization.

History of the Collaborative for High Performance Schools

The group that would later evolve into the Collaborative for High Performance Schools initially met in 1999. The first members of this group included the California Energy Commission, Pacific Gas and Electric Company, San Diego Gas and Electric, and Southern California Edison. The group's purpose was to determine the best way to improve the performance of California's schools. Since this initial meeting additional government, utility, school districts, design professionals, companies, and non-profit organizations have joined CHPS. The increased membership brought an influx of new expertise. This allowed for CHPS to expand its scope of work. "The mission of the Collaborative for High Performance Schools is to facilitate the design, construction and operation of high performance schools: environments that are not only energy and resource efficient, but also comfortable, well lit, and containing the amenities for a quality education." In particular, CHPS hopes to increase student performance, reduce school operation costs, and reduce the schools impact on the environment. To accomplish these goals, CHPS developed a criteria used to define High Performance Schools.

Collaborative For High Performance Schools Organization

The CHPS organization is made up of many organizations that have come together to help California Schools. Members include school design, construction and maintenance service providers, educational institutions and services, government and non-profit organizations, product manufacturers, utility and energy service companies and individual CHPS supporters. Currently the CHPS organization has approximately 225 members. CHPS members receive several different benefits from the CHPS organization. The greatest benefit to CHPS members is the opportunity to influence the direction of the CHPS organization. This allows for CHPS members to ensure that the CHPS organization evolves, and includes ideas and technologies that are important to the CHPS members.

To ensure that any technologies or ideas that are suggested by CHPS members are properly assessed, the organization developed the CHPS technical committee. The CHPS technical committee is tasked with assessing and analyzing any new methods that schools use to meet the high performance school criteria. Additionally, the CHPS technical committee provides options for future iterations of the high performance school criteria. These options are reviewed by the CHPS members and the CHPS board, and ultimately go through a public review.

The CHPS board consists of nineteen individuals. These volunteers represent the entire CHPS organization and provide personal expertise in a number of different fields. The decisions made by the CHPS board define the actions taken to meet the goals of the CHPS organization. When determining actions for the CHPS organization, the CHPS board takes into account input from the CHPS technical committee and CHPS members.

Collaborative for High Performance Schools Best Practices Manual

The foundation of the CHPS Organization is the six-volume Best Practices Manual. The first three volumes of the Best Practices Manual were originally released in 2002. These included Volume 1 – Planning, Volume 2 – Design, and Volume 3 – Criteria. Volume 4 – Maintenance and Operations and Volume 5 – Commissioning were released in 2004. The final volume, Volume 6 – Relocatable Classrooms, was released in 2006. Each volume of the Best Practices Manual has a different focus. This allows for the Best Practices Manual to appeal to a wider audience.

Volume 1: Planning

The first volume of the Best Practices Manual is targeted towards the persons responsible for facilities. This may include parents, teachers, administrators, and school board members. Volume 1 – Planning has two purposes. The first is to introduce and define the characteristics of high performance schools. This information is useful in educating those new to the high performance schools concept. The benefits of building high performance schools are also provided.

The second purpose of Volume 1 is to provide guidance in the process of planning, designing, and getting approval for high performance schools. The process guide provides information on the general process of school construction, and key actions to ensure the development of a high performance school. To ensure that the issue of cost does not hinder a project, Volume 1 includes information regarding financing information for high performance

schools. Alternative funding sources such as the California Energy Commission's Bright Schools Program are given as alternative sources for financing high performance schools. More importantly, concepts such as Life-Cycle Costing and Reduced Operating Expenses are also discussed.

The introduction of high performance schools concepts and process guide make the first volume of the Best Practices Manual essential in the early stages of any high performance school project. Users will also find it useful to consult Volume 1 during each stage of the design, development, and construction process.

Volume 2: Design

The second volume of the Best Practices Manual is targeted towards architects, engineers, and design teams. In association with the change in audience, Volume 2 focuses on technical issues. This volume also introduces several design tools that are commonly used in designing high performance schools. Volume 2 is subdivided into eight sections corresponding with major disciplines in the building design process. Each section of Volume 2 is further subdivided into guidelines.

Each guideline is meant to assist architects, engineers, or design teams during the design phase of high performance school construction. The guidelines provide a large amount of information regarding description of design strategies, applicability based on climate zone and room types, associated building codes and regulations, integrated design implications, cost effectiveness, and associated design tools. Corresponding CHPS Credits (which are defined in Volume 3) for each guideline are also identified.

Due to the complexity, and the amount of time that is required to incorporate appropriate strategies, these guidelines should be considered early in the design process. Assessing these guidelines at the beginning of the design process will also make it easier and cheaper to incorporate high performance features into schools.

Volume 3: Criteria

Volume 3 of the Best Practices Manual provides the criteria used to define high performance schools. The criteria provide clear design goals for project managers, architects, engineers, construction managers, and contractors. The flexibility of the criteria also allows for designers to develop high performance schools in a number of different regions, or under site-specific constraints.

The criteria are divided into six categories which are composed of prerequisites and optional credits. These categories include Sustainable Sites, Water, Energy, Materials, Indoor Environmental Quality, and Policy and Operations. Calculations and documentation procedures for meeting each prerequisite and credit, and the applicability of each prerequisite and credit based on the CHPS project type are all discussed in this volume. Lists of additional resources relating to the prerequisite or credit are also provided.

For each credit that a school meets the school is awarded a certain number of points. The number of points awarded per credit is dependent on the costs, and benefits of each criterion.

To ensure that the criteria are constantly reflecting the latest technologies and standards CHPS constantly upgrades these criteria. Input from CHPS Members, the CHPS Technical Committee, and the CHPS Board is considered during this process. Input from the technical and

practical aspects of constructing high performance schools allows revisions to the criteria to be feasible while still pushing for increased performance.

The latest 2006 edition of the criteria has 11 prerequisites and 85 points separated into the Sustainable Sites, Water, Energy, Materials, Indoor Environmental Quality, or Policy and Operations categories. New schools are required to meet all prerequisites, and achieve 32 points to be considered a high performance school by the CHPS organization. Major modernization and new buildings on an existing campus must meet the prerequisites based on the scope of the project and achieve 25 points to be considered a high performance school. All schools have the option of exceeding these minimum requirements.

Volume 4: Maintenance and Operations

The CHPS Organization determined that high performance schools go beyond designing and constructing a resource efficient building. Without effective maintenance and operations many of the benefits of high performance schools will be missed. Volume 4 was developed for facility management, maintenance, custodians, and groundskeepers.

Volume 4 provides information to ensure that high performance schools operate as designers intended. This volume provides information for building usage after the high performance school has completed construction. The manual provides strategies for avoiding improper use of building systems and poor maintenance practices that can greatly diminish the energy and cost savings of a high performance schools. Strategies for monitoring, controlling building systems, calibrating building systems, and other maintenance and operations recommendations are all discussed in Volume 4.

Volume 5: Commissioning

To further ensure that equipment in a high performance school is properly utilized, the CHPS Organization created a manual focused on commissioning. Volume 5 provides building owners with the basics of the commissioning process. The process defined in Volume 5 goes beyond the standard testing and verification definition of building commissioning.

The commissioning strategy outlined in Volume 5 is designed to link the design, construction, and occupancy phases of high performance schools projects. This overarching strategy facilitates improved integration and communication among design, construction, and operations staff. This communication ensures that systems function as intended. Beginning commissioning early may also reduce project delays and costs by reducing change orders during the construction phase.

Volume 6: Relocatable Classrooms

Volume 6 of the Best Practices Manual provides high performance guidelines for relocatable classrooms. The CHPS Organization developed these guidelines to help identify the differences between standard and high performance relocatable classrooms. The high performance relocatable classrooms share many of the features of permanent high performance classrooms. This allows for even relocatable classrooms to provide the same learning environment as standard classrooms.

While many of the design strategies highlighted in Volume 2 are also applicable to portable classrooms, there are several strategies and specifications that were developed specifically due to the constraints faced by relocatable classrooms. Among these differences are strategies and specifications regarding the portable classrooms' orientation, position, and commissioning.

Acceptance of the Collaborative for High Performance Schools in California

CHPS was originally started in the state of California. This has led to an increasing number of schools built using the CHPS Criteria in the state. CHPS continues to experience support and participation from California schools and school districts. Several different California school districts have recently adopted policies that require all new schools built in the district to be built using the CHPS Criteria. CHPS has also begun to work with the California state government in promoting high performance schools.

California Schools

Currently over 100 high performance schools have been constructed or designed using the CHPS Criteria. This includes schools that have been built using both the original 2002 CHPS Criteria and the newer 2006 CHPS Criteria. An additional 40 California schools are participating in the CHPS program. The number of high performance schools built utilizing the CHPS Criteria is evidence of the criteria's versatility. California currently contains 16 distinct climate zones, and the CHPS Criteria must be applicable in all of these zones. CHPS schools built in climate zones as diverse as Los Angeles and Truckee shows that the CHPS Criteria is applicable in a number of different environments.

With the increased exposure of the CHPS Criteria, schools have been able to more efficiently build high performance schools. This has lead schools to institute more high performance features per project. While the number of points required to be designated as a high performance school is set, many schools will achieve more. However, implementing every high performance feature recommended in the CHPS Criteria would result in very high project costs and is unrealistic in most school projects. Most schools that utilize the CHPS Criteria will include as many points as possible within their set budget. Approximately 20 schools have provided information regarding the number of credits that they have qualified for under the 2002 CHPS Criteria.

Figure 1. School Distribution by # of CHPS Points Met

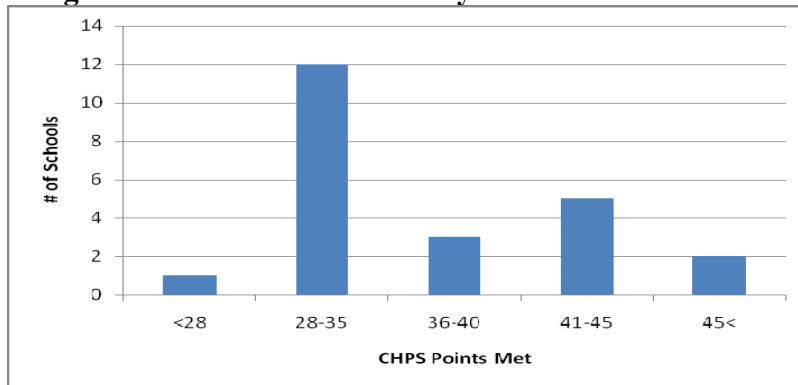


Figure 1 shows the number of schools meeting different CHPS point totals. Most of these schools achieved between 28 and 35 points, with several schools qualifying for over 40 points. The number of schools that are being built using the CHPS Criteria is continually increasing. The support of individual schools is expected to continue well into the future. More importantly, these individual schools have served as pilot programs or examples for many school districts.

California School Districts

The positive benefits realized by individual high performance schools have influenced the actions of many school districts. These school districts are now requiring that any new school built within the school district be built using the CHPS Criteria. Currently 27 school districts have adopted resolutions that reference the CHPS Criteria, or require all new construction and modernization to be built using the CHPS Criteria.

The school districts that have adopted CHPS Criteria have noticed a number of different benefits beyond those usually experienced by high performance schools. Due to specifying a single standard for equipment and operational practices at all schools the school district can reduce equipment, maintenance, and operational costs. School districts are able to recognize additional cost savings during the school design and construction phases through the reuse of high performance schools designs. The acceptance of the CHPS Criteria by school districts has, in turn, had an influence on California government.

California Government

The state of California has funded several programs focused on promoting energy efficiency in schools. Recently the California Office of Public Schools Construction set aside \$100 million through Proposition 1D to establish a High Performance Incentive Grant (HPIG) Program. Unlike previous state programs, which focused primarily on energy efficiency, the HPIG Program was created to incentivize all aspects of high performance schools. The HPIG Program currently focuses on five categories: site, water, energy, materials, and indoor environmental quality.

These categories are also prioritized in the CHPS Criteria. This common focus allowed California to use the CHPS Criteria as a basis for defining high performance schools. Members of the Office of Public Schools Construction, the Division of the State Architect, and the California Energy Commission worked with CHPS staff to identify high performance schools criteria that could be funded under the HPIG Program. As a result, there are many similarities between the CHPS Criteria, and the requirements for accessing the HPIG Program. Some of the

few differences between the CHPS Criteria and the HPIG Program are highlighted in Tables 1 and 2.

Table 1. 2006 CHPS Criteria Edition

	New Schools		Major Modernization and New Building on Existing Campus	
	CHPS	HPIG	CHPS	HPIG
Minimum Points for Participation	32	27	25	20
Prerequisites	All Prerequisites Required	Prerequisite SS6.0: <i>Schools as Learning Tools</i> is not Required	Prerequisites are Required Based on the Scope of the Project	Prerequisite SS6.0: <i>Schools as Learning Tools</i> is not Required; Prerequisites are Required Based on the Scope of the Project

Table 2. Additional Requirements for New Schools, Major Modernizations, and New Buildings on Existing Campuses

	CHPS	HPIG
Energy Category	A minimum of 2 credits must be obtained from the Energy Category	A minimum of 4 credits must be obtained from exceeding minimum energy efficiency, or renewable energy; Additional credits are offered for providing renewable energy.
Policy and Operations Category	A maximum of 4 credits can be used from the Policy and Operations Category to reach the minimum points for participation	No credits can be claimed in the Policy and Operations Category
Sites Category		Cannot claim credits for using the school as a teach tool

As these differences are very minor, schools that are designed and built using the CHPS Criteria can easily qualify for the HPIG Program. Over 30 schools have already applied to the HPIG Program. It is particularly noticeable that school districts that have adopted policies recognizing the CHPS Criteria, such as the Los Angeles Unified School District, are very active in the HPIG program.

Figure 2. School Distribution by # of HPIG Points Met

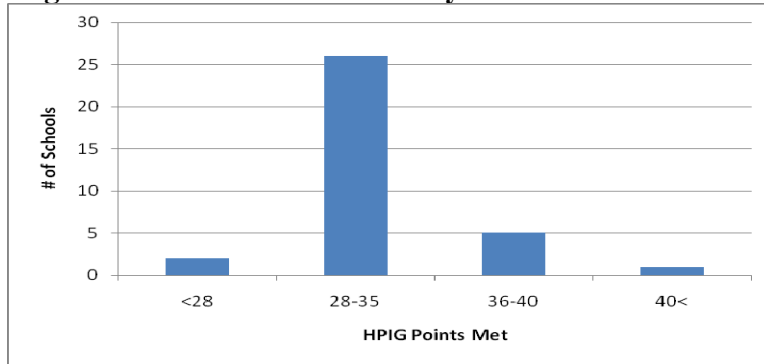


Figure 2 shows the number of schools meeting different HPIG point totals. It should be noted that the distribution shown in Figure 2 is similar to the distribution seen in Figure 1. This shows that the differences between the CHPS Criteria and HPIG Program are minor. Experience with the CHPS Criteria has made adoption of the state HPIG program simple for many schools and school districts.

Effect of CHPS and HPIG on California School Energy Performance

For new construction projects, the 2006 CHPS Criteria has 20 points and the HPIG Program has 22 points allocated to the energy category. The majority of these points can be met by building energy efficient schools. In California, schools are required to build to California Code of Regulation (CCR), Title 24, Part 6. For a school to qualify for either CHPS or the HPIG Program, the school is required to be 10% more energy efficient than the minimum compliance for Title 24, Part 6. With the increased number of schools and school districts adopting CHPS, and increase participation in the HPIG Program, the focus on energy efficiency has also increased.

Figure 3. HPS School Energy Performance

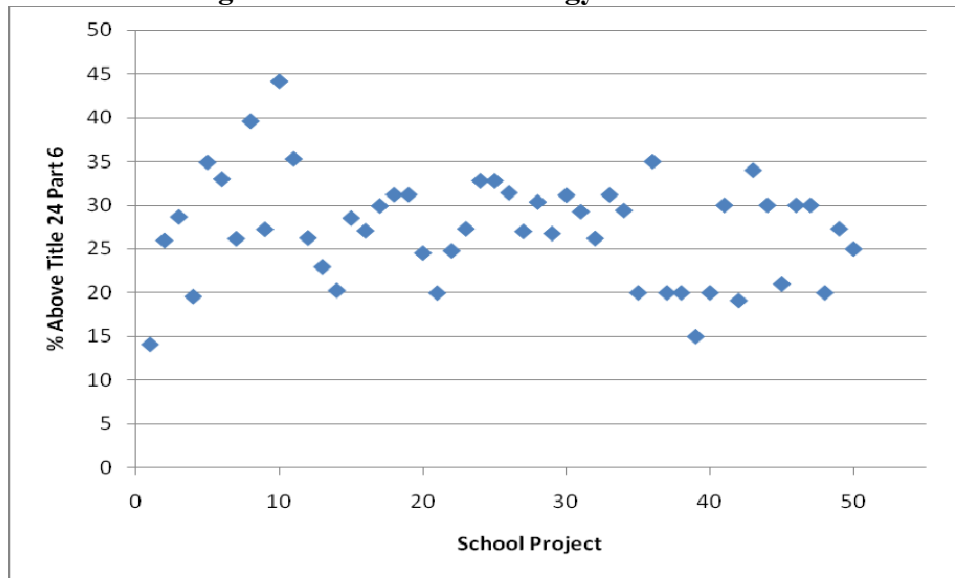


Figure 3 provides the percentage of energy efficiency above Title 24, Part 6 for approximately 50 schools that have participated in CHPS or the HPIG Program. On average, the schools performed 27% more efficiently than the minimum compliance for Title 24, Part 6. Schools that are built to be more efficient than Title 24, Part 6 enjoy many benefits including lower energy costs.

Figure 4. CHPS/HPIG Points Affect on Energy Performance

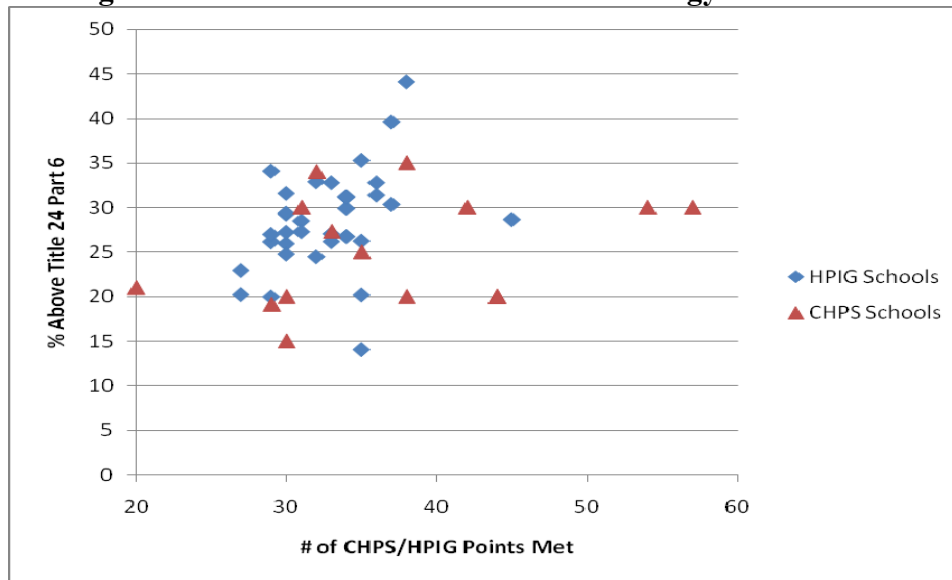


Figure 4 shows the percentage of energy efficiency above Title 24, Part 6 as a function of the number of CHPS or HPIG points that the school site has earned. As seen in Figure 4, the energy performance of the school seems to be independent of the number of CHPS or HPIG points that the school earned. Figure 4 shows schools that achieved the same number of CHPS or HPIG points can differ significantly in energy performance. This variation emphasizes the versatility of these programs. Schools that cannot maximize energy efficiency may still qualify for CHPS or the HPIG Program by gaining points in other areas. It is this versatility that has resulted in the widespread adoption of the CHPS Criteria and participation in the HPIG Program.

The widespread acceptance of the CHPS Criteria and the benefits of high performance schools have also influenced school communities outside of California. The CHPS Criteria has garnered attention throughout the United States. A number of different states are currently working on or have adopted similar criteria for school design and construction.

Acceptance of Collaborative for High Performance Schools Outside of California

The benefits of the CHPS Criteria have had an impression on school organizations outside California as well. As a result, several organizations adopted their own version of the CHPS Criteria to identify measures that could be taken for schools in their area. California provides a very diverse environment in which a broad criterion was required to provide equal opportunities across the state. Other organizations and states governments adopted criteria specified to local environments and state building codes. Additionally, high performance attributes that are not feasible for certain environments are not considered in these new criteria. While still providing the benefits of high performance schools, the changed criteria can also provide specific solutions to specific conditions.

Massachusetts Collaborative for High Performance Schools

In 2006 the Massachusetts Technology Collaborative provided a set of criteria based on the CHPS Criteria. The Massachusetts Technology Collaborative is a state agency focused on promoting renewable energy technologies. The Massachusetts High Performance Green Schools

Guidelines: Criteria (MA-CHPS) defined viable high performance criteria for the state of Massachusetts.

Appropriate changes were made with the intent of adapting this new criterion to the Massachusetts code requirements, the local climate, and local environmental concerns. For example, the Massachusetts' emphasis on indoor environmental health issues resulted in a large number of prerequisites in the MA-CHPS Indoor Environmental Quality category. An additional change made was to incentivize the utilization of the MA-CHPS. Schools that participate in the program may receive up to a 2.0% reimbursement incentive from the Massachusetts School Building Authority. This reimbursement is based on the school construction costs, and is similar to California's HPIG Program.

New York Collaborative for High Performance Schools

The New York State Education Department with support from the New York State Energy Research and Development Authority has also put out a modified version of the CHPS Criteria. As with the MA-CHPS, the New York CHPS Guidelines (NY-CHPS) were tailored specifically towards the needs of the state of New York. NY-CHPS also focused on promoting Life Cycle Cost analysis and post-construction monitoring. This has resulted in additional credit options in several categories including Materials and Indoor Environmental Quality. With the increased credit options, the NY-CHPS require that high performance schools achieve a minimum of 65 points.

Washington Sustainable Schools Protocol

The Washington Sustainable Schools Protocol (WSSP), which is based on the original CHPS Criteria, is the result of a pilot program performed by the state of Washington. The purpose of the pilot program was to identify the costs and benefits of building high performance schools. While it was acknowledged that all credits included in the WSSP provided benefits to schools, protocol developers determined that there were several credits that deserved higher priority. To reflect this, the WSSP contains a list of high priority credits. This list also had the advantage of helping new WSSP applicants prioritize credits.

Northeast Collaborative for High Performance Schools Protocol

The Northeast Collaborative for High Performance Schools Protocol (NE-CHPS) was developed for specific use by schools in the New England area. This protocol was developed using the MA-CHPS and NY-CHPS as guides. NE-CHPS has seen widespread adoption among New England states. NE-CHPS has been recommended by both the Maine and Vermont department of education, and Connecticut has accepted NE-CHPS as an alternative to state mandated goals. New Hampshire and Rhode Island both provide reimbursement incentives to schools that build using NE-CHPS.

The incorporation of NE-CHPS in these states shows that high performance schools criteria can be promoted in a number of different ways. The best way of promoting high performance schools will be based on location.

Currently over 175 schools are being built using high performance standards. The growing number of states incorporating high performance school standards has shown that

collaboration between states in developing area specific versions of the CHPS Criteria is possible.

A National Collaborative for High Performance Schools

As a result of the success of high performance school standards in several states, a National Collaborative for High Performance Schools organization has been developed. This new organization is still in its early stages. National CHPS would serve as an overarching organization to assist local CHPS organizations and state departments of education. The full extent of assistance and other actions performed by National CHPS is still under discussion. The level of involvement of local CHPS Members is also under debate. However, the main goal of defining high performance school standards will still remain.

Conclusion

The move towards a National Collaborative for High Performance Schools organization highlights the Nation's interest in high performance schools. The ability of the National CHPS organization to help coordinate local CHPS organizations will be of great assistance to new locations looking to develop high performance schools. A National CHPS organization may also help with the spread of new and innovative technologies between local organizations.

Of particular assistance to the spread of CHPS is the experience of states that are currently providing high performance school standards programs. States such as Massachusetts, New York, Vermont, Maine, Connecticut, Rhode Island, New Hampshire, Washington, and California can share many of the experiences associated with incorporating the standards. Advice from veteran CHPS organizations will be helpful for new organizations in marketing and applying these new standards in their locations.

The idea of applying a CHPS Criteria originally began in a single state. However, the CHPS Criteria continued to spread as the benefits of building high performance schools were noticed by more people. With the continued interest in high performance schools, the use of the CHPS Criteria will continue to grow. Whether adopting the CHPS Criteria on a national, state, district, or even a school level the benefits will be immeasurable.

References

[CHPS] The Collaborative for High Performance Schools. 2008. "CHPS School Project List." http://www.chps.net/chps_schools/schools_in_progress.htm. San Francisco, Calif.: CHPS Inc.

The Collaborative for High Performance Schools. 2002. "Best Practices Manual Volume I: Planning." San Francisco, Calif.: CHPS Inc.

The Collaborative for High Performance Schools. 2002. "Best Practices Manual Volume II: Design." San Francisco, Calif.: CHPS Inc.

The Collaborative for High Performance Schools. 2001. "Best Practices Manual Volume III: Criteria." San Francisco, Calif.: CHPS Inc.

The Collaborative for High Performance Schools. 2006. "Best Practices Manual Volume III: Criteria." San Francisco, Calif.: CHPS Inc.

The Collaborative for High Performance Schools. 2004. "Best Practices Manual Volume IV: Maintenance and Operations." San Francisco, Calif.: CHPS Inc.

The Collaborative for High Performance Schools. 2006. "Best Practices Manual Volume V: Commissioning." San Francisco, Calif.: CHPS Inc.

The Collaborative for High Performance Schools. 2006. "Best Practices Manual Volume VI: Relocatable Classrooms." San Francisco, Calif.: CHPS Inc.

The Massachusetts Technology Collaborative. 2006. "Massachusetts High Performance Green Schools Guidelines: Criteria Version 1.0." http://www.chps.net/manual/MA-CHPS_Green_School_Guidelines_10_20_06.pdf. Westborough, Mass.: CHPS Inc. and MTC.

Northeast Energy Efficiency Partnership. 2007. "Northeast Collaborative for High Performance Schools Protocol Version 1.1." http://www.neep.org/HPSE/NE_CHPS.pdf. San Francisco, Calif.: CHPS Inc. and NEEP

New York State Energy Research and Development Authority. 2007. "NY-CHPS Version 1.1 High Performance Schools Guidelines." http://www.emsc.nysed.gov/facplan/NYSERDA/NY-CHPS_Ver_1-1_Feb_07.pdf. San Francisco, Calif.: CHPS Inc.

Washington Sustainable School Protocol. 2006. "Criteria for High Performance Schools." <http://www.k12.wa.us/SchFacilities/pubdocs/HighPerformanceSchools/WSSPFinalDraft2006.pdf>. Wash.: