

BUILDING DESIGN & CONSTRUCTION®

Green Building White Paper Research - Schools

Conducted for: Building Design & Construction

Conducted By: Reed Research Group

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Background, Methodology and Objectives

In September 2004, Reed Research Group along with Building Design & Construction conducted a survey among professionals involved in the field of education to understand their opinions, perceptions, and actions regarding green schools.

Professionals involved in the K-12 setting were targeted. Several associations partnered with BD&C and Reed Research Group to survey their members on this subject. The Association of School Business Officials International (ASBO), The Council of Educational Facility Planners (CEFPI), and the National School Boards Association (NSBA) participated in this school (K-12) version of the study.

This survey was conducted online. Each organization sent their members an email inviting them participate in this study. A total of 437 respondents participated in this study. Respondent participation per group is as follows: CEFPI (304), NSBA (103), and ASBO (30).

The following were objectives of this study:

- To establish respondent familiarity with green building terms, as well as, level of expertise in the area.
- To determine the amount of consideration given to a high performance/sustainable/green design when contemplating a school project.
- To explore perceived cost differences associated with building green and the acceptable differential for gaining approval of a sustainable/green school.
- To understand perceived barriers to incorporating sustainable design into school projects.
- To determine the percentage of respondents that have actually incorporated high performance/sustainable/green concepts into their firm's/school district's recent designs and to define which concepts.
- To pinpoint who drives the primary impetus to incorporate sustainable/green elements.
- To explore the role of sustainably designed or green buildings as a teaching tool.

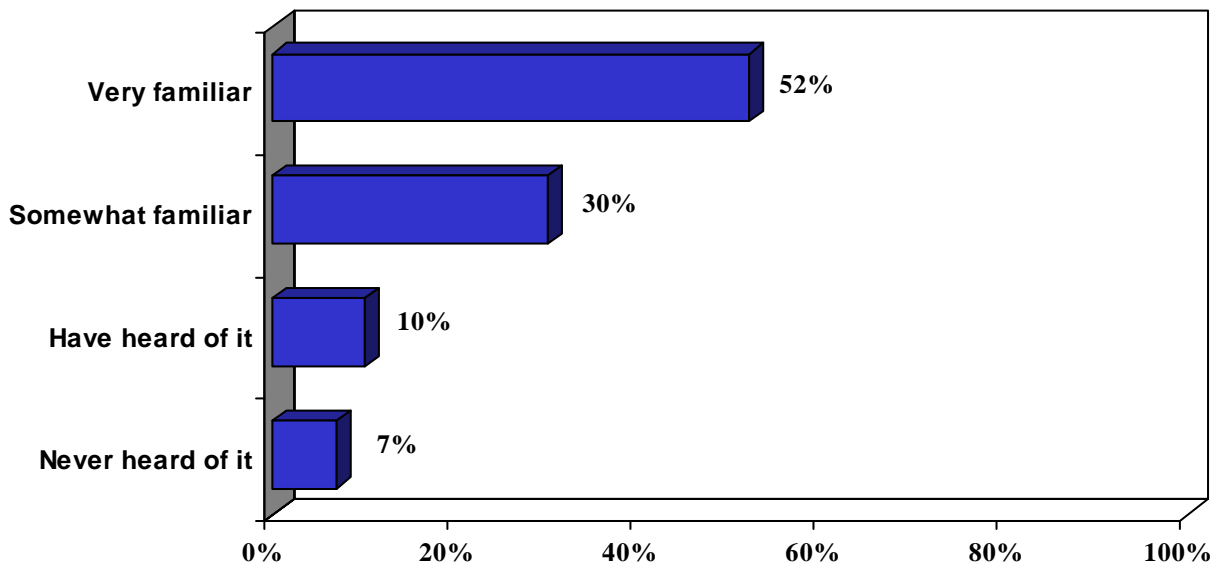
Executive Summary

- Respondents are familiar with green building terms and principles. Over four-fifths are at least somewhat familiar with the term “high performance/sustainable/green schools”. Nearly two-fifths are at least somewhat familiar with the Collaborative for High Performance Schools (CHPS) Best Practice Manual; over two-thirds with the LEED rating system.
- Respondents expressed differing levels of expertise with regards to high performance, sustainably designed, or green school buildings. Over three-fifths of respondents indicated they are at least somewhat experienced in the area, while over one quarter indicate little experience but a definite interest. Virtually no respondents expressed little interest in the area.
- Nearly two-thirds of respondents believe that high performance/sustainable/green schools are more costly to build/develop. Although more costly to develop, respondents find a cost differential of 7 percent as acceptable to gain approval of a sustainable/green building in their school district.
- The costs associated with green buildings prove to be the biggest barrier to acceptance in school districts. Nearly two-thirds of respondents indicate “adds significantly to initial costs of construction” as a barrier. Priority of programs also is a common barrier, with nearly half indicating “other program needs more important than green building”.
- Over two-thirds of respondents have actually incorporated sustainable/green concepts in their recent school building designs. Energy management, daylighting, and automated lighting controls are the most popular concepts currently being incorporated.
- The impetus to incorporate green elements came from a variety of sources among those respondents who indicate they have incorporated them. Over two-fifths indicate the primary impetus came from the architect while over one quarter indicate the impetus came from the facilities planner/director.
- When it comes to leading the green effort, nearly two-fifths of respondents feel the architect or engineer should be at the forefront. One in four feel the school administration should lead the effort.
- Three out of four respondents believe high performance/sustainable/green schools can serve as a teaching tool for students. As one respondent clearly sums it up, “Children are intellectual sponges. They want to know everything. The more that they understand how the environment works around them the better citizens they will be when they grow up.”

I: Study Findings

Familiarity with “High Performance/Sustainable/ Green Schools”

How familiar are you with the term “high performance/sustainable/green schools”?

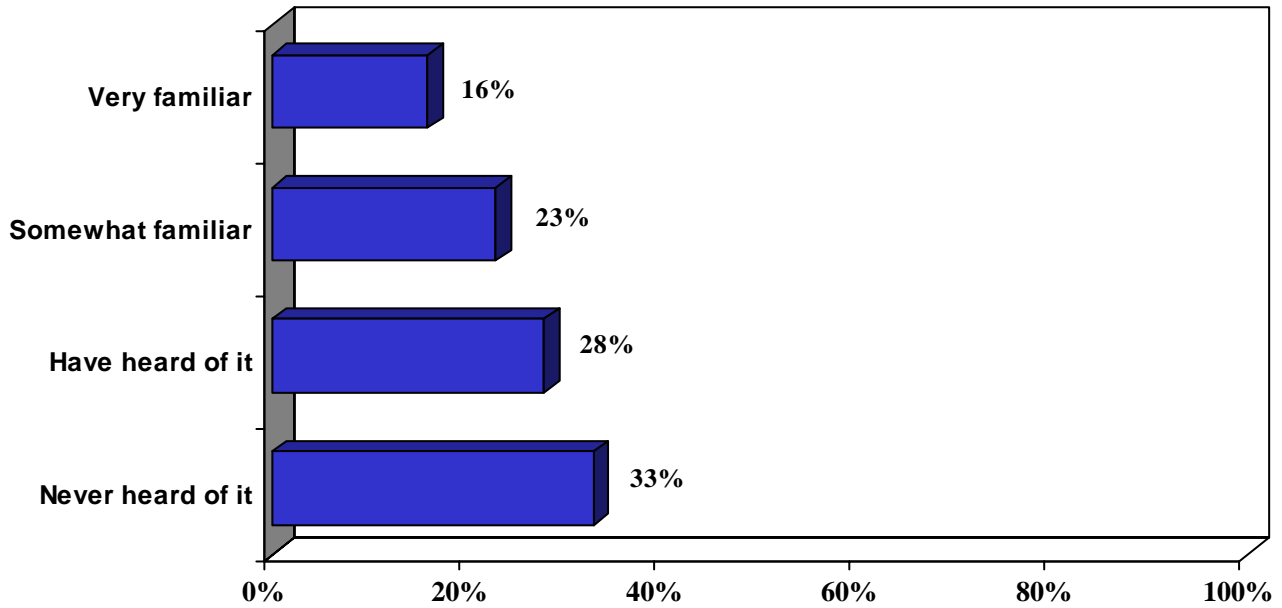


<i>by respondent group</i>	TOTAL	ASBO	CEFPI	NSBA
Very familiar	52%	27%	69%	12%
Somewhat familiar	30%	40%	27%	37%
Have heard of it	10%	30%	3%	24%
Never heard of it	7%	3%	1%	27%

Respondents have a high level of familiarity with the term “high performance/sustainable/green schools”. Over four-fifths are at least somewhat familiar with the terminology.

Familiarity with CHPS Best Practice Manual

How familiar are you with the Collaborative for High Performance Schools (CHPS) Best Practice Manual?

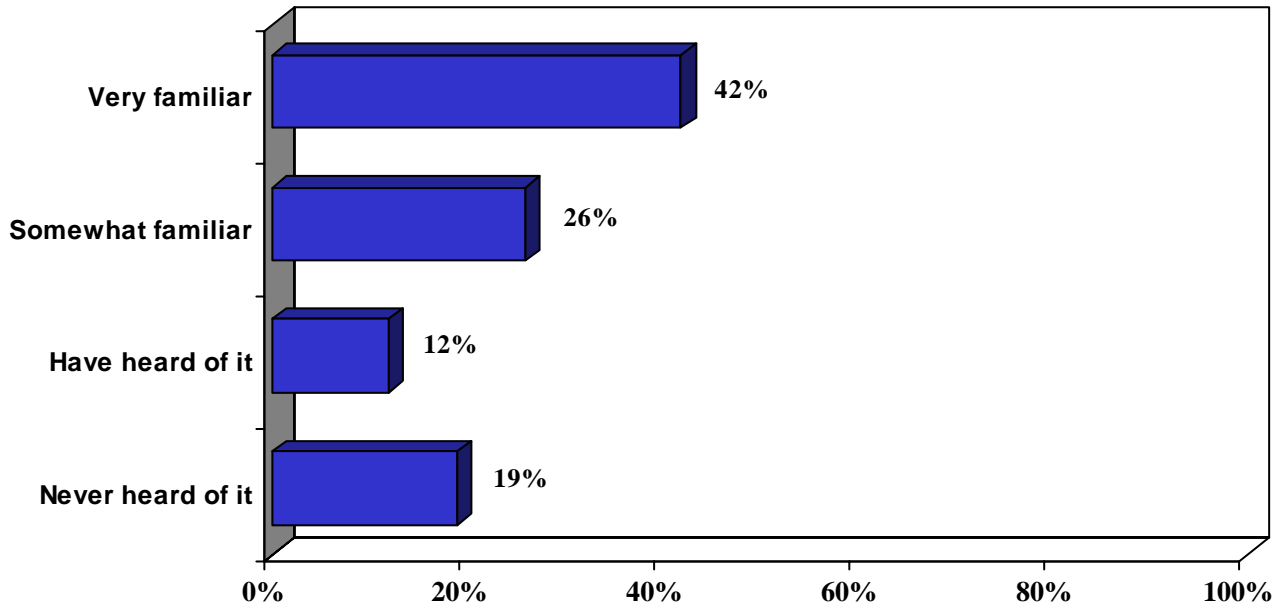


<i>by respondent group</i>	TOTAL	ASBO	CEFPI	NSBA
Very familiar	16%	3%	22%	4%
Somewhat familiar	23%	13%	27%	13%
Have heard of it	28%	47%	25%	30%
Never heard of it	33%	37%	26%	53%

Nearly two-fifths of respondents are at least somewhat familiar with the Collaborative for High Performance Schools (CHPS) Best Practice Manual. One in three respondents have never heard of the manual.

Familiarity with LEED Rating System

How familiar are you with the LEED (Leadership in Energy and Environmental Design) green building rating system developed by the US Green Building Council?

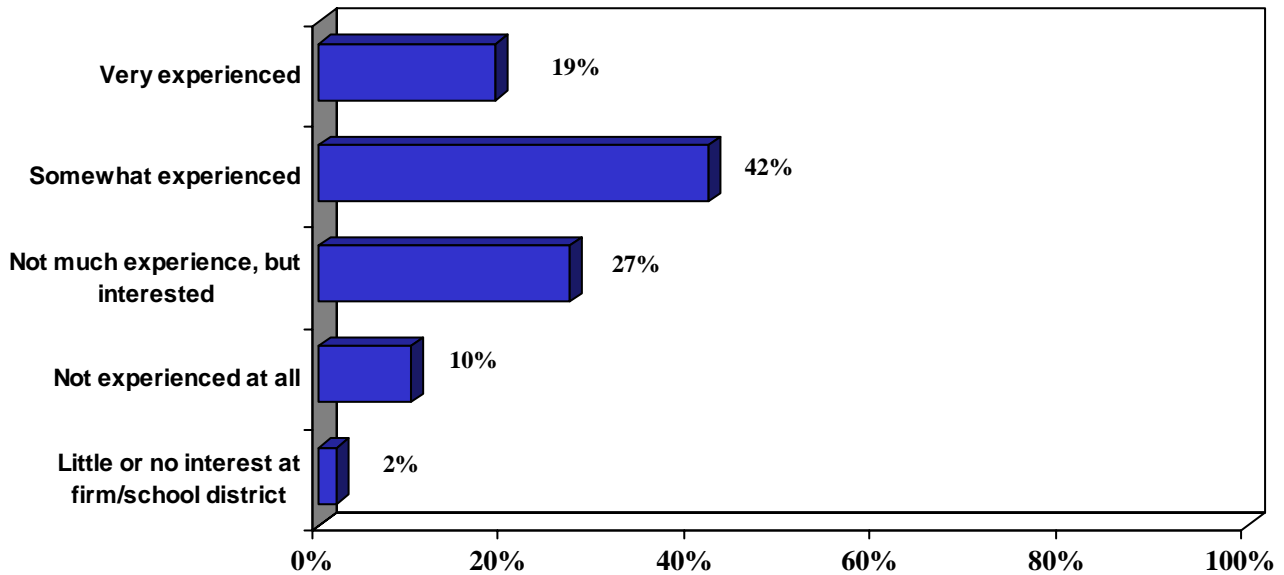


<i>by respondent group</i>	TOTAL	ASBO	CEFPI	NSBA
Very familiar	42%	17%	57%	8%
Somewhat familiar	26%	33%	29%	17%
Have heard of it	12%	27%	8%	21%
Never heard of it	19%	23%	6%	54%

Over two-thirds of respondents are at least somewhat familiar with the LEED rating system. Nearly one-fifth have never heard of it.

Level of Expertise in Green School Buildings

How would you characterize the level of expertise in high performance, sustainably designed, or green school buildings at your firm or school district?



<i>by respondent group</i>	TOTAL	ASBO	CEFPI	NSBA
Very experienced	19%	3%	25%	7%
Somewhat experienced	42%	43%	47%	27%
Not much experience, but interested	27%	30%	23%	39%
Not experienced at all	10%	17%	5%	23%
Little or no interest in sustainable design at my firm/school district	2%	7%	0%	4%

Over three-fifths of respondents indicate at least some level of experience in high performance, sustainably designed, or green school buildings at their firm or school district. CEFPI members prove to have the most experience in the area among the three groups participating. Overall, over one quarter of respondents indicate they don't have much experience, but are interested.

Level of Consideration Given to Green Design

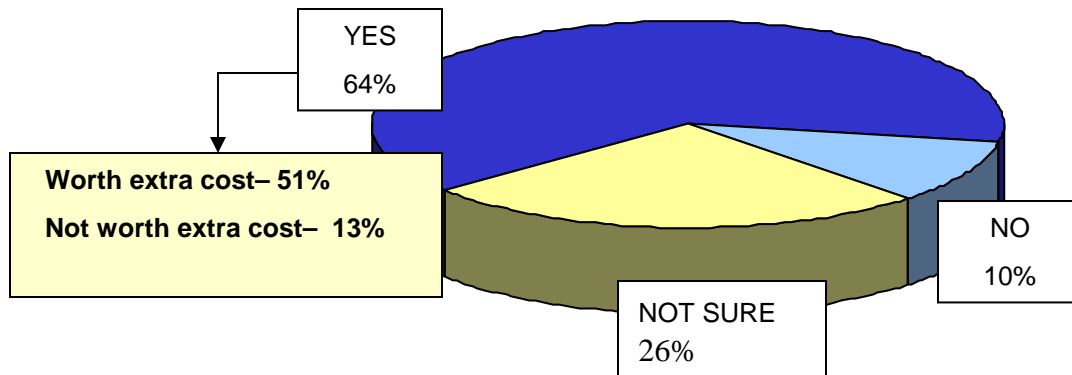
What level of consideration should be given to High Performance/Sustainable/Green Design when a school project is being contemplated? (Please rate on a scale of 1 to 5 where 5=High level of Consideration and 1=Low level of Consideration.?)

	High Level of Consideration (5)			Low Level of Consideration (1)		MEAN
Total	42%	39%	14%	3%	2%	4.17
ASBO	53%	37%	10%	0%	0%	4.43
CEFPI	43%	39%	14%	2%	2%	4.19
NSBA	37%	40%	15%	5%	3%	4.04

Respondents agree that a high level of consideration should be given to a high performance/sustainable/green design when a school project is being contemplated. The average consideration level rating was a 4.17 with 5 being the highest level on the scale. The average consideration scores for all groups were higher than a 4 on the scale of 1 to 5.

Green Schools More Costly to Build/Develop

Based on your expertise and knowledge, are high performance/sustainable/green schools more costly to build/develop?



	Total	ASBO	CEFPI	NSBA
Yes (Net)	64%	63%	74%	36%
Yes, but they're worth the extra cost	51%	47%	60%	28%
Yes, but they're not worth the extra cost	13%	17%	14%	8%
No, they're not more costly	10%	3%	12%	5%
Not sure	26%	33%	14%	59%

Nearly two-thirds of respondents agree that high performance/sustainable/green schools are more costly to build/develop. Of these respondents, however, over half feel the effort is worth the extra cost. Roughly one quarter are not sure if there are any cost differences associated with building green.

Acceptable Initial Cost Differential to Gain Approval

From your experience, what initial cost differential would be acceptable in your school district to gain approval of High Performance/Sustainable/Green School?

	Total	ASBO	CEFPI	NSBA
Up to 5%	37%	10%	39%	39%
Up to 10%	29%	43%	30%	24%
Up to 15%	6%	10%	7%	3%
Up to 20%	5%	7%	3%	9%
More than 20%	1%	0%	1%	2%
MEAN	6.78	8.95	6.41	7.32
Not acceptable at any increased cost	14%	7%	14%	14%
Do not believe such school should cost more to build	8%	23%	7%	8%

Respondents find a cost differential of 7% on average, acceptable in order to gain approval of a high performance/sustainable/green school.

Barriers to Acceptance of Green Schools

What (if any) do you perceive to be as barriers to High Performance/Sustainable/Green Schools in your district?

	Total	ASBO	CEFPi	NSBA
"Adds significantly to initial costs of construction"	63%	57%	67%	52%
"Other program needs more important than green building"	46%	30%	52%	35%
"Community not interested in or willing to pay for green schools"	30%	23%	33%	26%
"Not required by law or regulation, therefore not necessary"	26%	30%	30%	14%
"Green Schools hard to justify, even on the basis of long-term savings"	23%	13%	27%	12%
"Too much extra paperwork"	21%	13%	27%	7%
"Not comfortable with new ideas"	17%	7%	23%	1%
"Too complicated"	14%	10%	16%	9%
"High performance/Sustainable/Green Schools are not seen as a barrier"	13%	17%	14%	9%
"Not applicable/Don't Know"	9%	13%	4%	24%
"Not sufficiently flexible"	5%	3%	6%	3%

The costs associated with green buildings proves to be the biggest barrier to acceptance within school districts. Over three-fifths of respondents indicate “adds significantly to initial costs of construction” as a barrier. Priority of programs is another barrier at the top of the list. Nearly half of respondents indicate “other program needs more important than green building”.

Mean Importance of Attributes When Planning Green Schools

How important are the following attributes when planning a High Performance/Sustainable/Green School?

(SUMMARY OF MEAN SCORES)

	TOTAL	ASBO	CEFPI	NSBA
Indoor environmental quality	4.72	4.90	4.72	4.68
Long-term maintenance	4.61	4.80	4.55	4.71
Elimination of toxic materials and substances	4.59	4.70	4.49	4.88
Energy management	4.59	4.90	4.53	4.69
Safety and security	4.55	4.70	4.47	4.74
Daylighting	4.46	4.60	4.47	4.39
Building envelope design	4.34	4.27	4.52	3.80
Life cycle cost analysis	4.31	4.60	4.28	4.29
Energy analysis/modeling tools	4.26	4.31	4.24	4.32
Acoustics/soundproofing	4.22	4.40	4.18	4.31
Environmentally responsive site design	4.17	4.30	4.18	4.10
Water conservation	4.05	4.20	4.05	4.00
Building commissioning	3.90	3.76	4.08	3.33
Environmentally sensitive landscaping	3.89	4.10	3.87	3.89
School building utilized as teaching tool	3.86	4.31	3.73	4.13
Recycled/renewable building materials	3.56	3.70	3.57	3.47
Innovative design	3.40	3.47	3.45	3.24
Reused construction & demolition waste	3.21	3.28	3.19	3.22
Geothermal heating/cooling	3.20	3.30	3.05	3.63

Indoor environmental quality scored the highest among respondents based on importance when planning a high performance/sustainable/green school. Long-term maintenance, elimination of toxic materials and substances, and energy management also scored highly based on importance. Geothermal heating/cooling and reused construction & demolition waste landed at the bottom of the list in terms of importance when planning a high performance/sustainable/green school.

Importance of Attributes When Planning Green Schools (Total)

How important are the following attributes when planning a High Performance/Sustainable/Green School? (Please rate on a 1 to 5 scale with 5 as very important and 1 as not important)

	<i>Very Important</i>		<i>Not Important</i>			Mean
	5	4	3	2	1	
Indoor environmental quality	76%	20%	4%	0%	0%	4.72
Long-term maintenance	65%	30%	5%	0%	0%	4.61
Elimination of toxic materials and substances	69%	23%	7%	1%	0%	4.59
Energy management	66%	28%	6%	0%	0%	4.59
Safety and security	67%	23%	8%	1%	1%	4.55
Daylighting	58%	32%	8%	1%	0%	4.46
Building envelope design	51%	34%	13%	1%	1%	4.34
Life cycle cost analysis	46%	40%	13%	1%	0%	4.31
Energy analysis/modeling tools	46%	38%	15%	2%	0%	4.26
Acoustics/soundproofing	43%	39%	16%	2%	0%	4.22
Environmentally responsive site design	42%	38%	16%	4%	0%	4.17
Water conservation	38%	36%	20%	5%	1%	4.05
Building commissioning	37%	28%	26%	7%	3%	3.90
Environmentally sensitive landscaping	30%	39%	24%	7%	1%	3.89
School building utilized as teaching tool	35%	30%	25%	8%	3%	3.86
Recycled/renewable building materials	19%	34%	34%	11%	3%	3.56
Innovative design	14%	31%	41%	11%	4%	3.40
Reused construction & demolition waste	10%	30%	38%	16%	6%	3.21
Geothermal heating/cooling	17%	23%	34%	16%	10%	3.20

Importance of Attributes When Planning Green Schools (ASBO)

How important are the following attributes when planning a High Performance/Sustainable/Green School? (Please rate on a 1 to 5 scale with 5 as very important and 1 as not important)

	<i>Very Important</i>			<i>Not Important</i>		Mean
	5	4	3	2	1	
Energy management	90%	10%	0%	0%	0%	4.90
Indoor environmental quality	93%	3%	3%	0%	0%	4.90
Long-term maintenance	83%	13%	3%	0%	0%	4.80
Elimination of toxic materials and substances	73%	23%	3%	0%	0%	4.70
Safety and security	77%	17%	7%	0%	0%	4.70
Daylighting	77%	7%	17%	0%	0%	4.60
Life cycle cost analysis	67%	27%	7%	0%	0%	4.60
Acoustics/soundproofing	50%	40%	10%	0%	0%	4.40
Energy analysis/modeling tools	48%	34%	17%	0%	0%	4.31
School building utilized as teaching tool	52%	31%	14%	3%	0%	4.31
Environmentally responsive site design	40%	50%	10%	0%	0%	4.30
Building envelope design	47%	33%	20%	0%	0%	4.27
Water conservation	47%	30%	20%	3%	0%	4.20
Environmentally sensitive landscaping	40%	33%	23%	3%	0%	4.10
Building commissioning	31%	24%	38%	3%	3%	3.76
Recycled/renewable building materials	20%	40%	30%	10%	0%	3.70
Innovative design	13%	33%	40%	13%	0%	3.47
Geothermal heating/cooling	23%	13%	33%	30%	0%	3.30
Reused construction & demolition waste	7%	34%	38%	21%	0%	3.28

Importance of Attributes When Planning Green Schools (CEFPI)

How important are the following attributes when planning a High Performance/Sustainable/Green School? (Please rate on a 1 to 5 scale with 5 as very important and 1 as not important)

	Very					Not		Mean
	Important					Important		
	5	4	3	2	1			
Indoor environmental quality	75%	22%	3%	0%	0%	4.72		
Long-term maintenance	61%	33%	6%	0%	0%	4.55		
Energy management	60%	32%	8%	0%	0%	4.53		
Building envelope design	61%	31%	8%	0%	0%	4.52		
Elimination of toxic materials and substances	62%	27%	9%	1%	1%	4.49		
Safety and security	62%	26%	10%	1%	1%	4.47		
Daylighting	58%	32%	8%	1%	0%	4.47		
Life cycle cost analysis	43%	42%	13%	1%	0%	4.28		
Energy analysis/modeling tools	44%	39%	15%	2%	0%	4.24		
Environmentally responsive site design	43%	36%	17%	3%	0%	4.18		
Acoustics/soundproofing	42%	36%	19%	2%	0%	4.18		
Building commissioning	44%	29%	19%	6%	2%	4.08		
Water conservation	38%	36%	19%	6%	1%	4.05		
Environmentally sensitive landscaping	27%	41%	25%	6%	1%	3.87		
School building utilized as teaching tool	27%	33%	27%	9%	3%	3.73		
Recycled/renewable building materials	18%	36%	33%	11%	2%	3.57		
Innovative design	15%	32%	40%	10%	3%	3.45		
Reused construction & demolition waste	8%	31%	38%	16%	6%	3.19		
Geothermal heating/cooling	12%	21%	38%	17%	11%	3.05		

Importance of Attributes When Planning Green Schools (NSBA)

How important are the following attributes when planning a High Performance/Sustainable/Green School? (Please rate on a 1 to 5 scale with 5 as very important and 1 as not important)

	Very Important 5	4	3	2	Not Important 1	Mean
Elimination of toxic materials and substances	89%	10%	1%	0%	0%	4.88
Safety and security	81%	15%	3%	0%	1%	4.74
Long-term maintenance	73%	24%	2%	0%	0%	4.71
Energy management	74%	22%	3%	1%	0%	4.69
Indoor environmental quality	74%	19%	6%	0%	0%	4.68
Daylighting	52%	38%	8%	2%	0%	4.39
Energy analysis/modeling tools	51%	34%	12%	3%	0%	4.32
Acoustics/soundproofing	42%	48%	9%	1%	0%	4.31
Life cycle cost analysis	47%	38%	13%	1%	1%	4.29
School building utilized as teaching tool	52%	19%	20%	6%	2%	4.13
Environmentally responsive site design	39%	40%	16%	6%	0%	4.10
Water conservation	38%	35%	21%	2%	4%	4.00
Environmentally sensitive landscaping	34%	34%	19%	10%	2%	3.89
Building envelope design	23%	43%	27%	3%	3%	3.80
Geothermal heating/cooling	31%	29%	22%	9%	9%	3.63
Recycled/renewable building materials	22%	25%	37%	12%	4%	3.47
Building commissioning	15%	24%	44%	11%	5%	3.33
Innovative design	13%	24%	43%	12%	7%	3.24
Reused construction & demolition waste	16%	22%	37%	16%	8%	3.22

Green Concepts Incorporated in Recent Designs

Have High Performance/Sustainable/Green concepts actually been incorporated into any of your firm's/school district's recent school designs?

	TOTAL	ASBO	CEFPI	NSBA
(Net) Yes	69%	53%	79%	46%
Yes, quite extensively	21%	13%	26%	8%
Yes, somewhat	49%	40%	53%	38%
No, but we plan to do so in the near future	11%	17%	12%	5%
No	20%	30%	9%	50%
(Net) No	31%	47%	21%	54%

Over two-thirds of respondents have incorporated high performance/sustainable/green concepts into their firm's or school district's recent school designs. While nearly one-third have not yet incorporate any of these concepts into their designs, roughly one-tenth of these respondents plan to do so in the near future.

Concepts Incorporated

Which of the following concepts have you incorporated?

	Total	ASBO	CEFPI	NSBA
Energy Management	85%	100%	86%	79%
Daylighting	79%	63%	84%	62%
Automated lighting controls	70%	81%	74%	47%
Acoustics/soundproofing	66%	81%	65%	66%
Low-emitting paints/finishes/adhesives	62%	44%	68%	36%
Low-emitting carpeting/furniture	57%	56%	63%	28%
Use of energy analysis/modeling tools	54%	56%	58%	32%
Building commissioning	49%	56%	57%	9%
Environmentally responsive site design	48%	31%	55%	19%
Recycled/renewable building materials	43%	25%	50%	13%
High-reflectance, high-emittance roof surfaces	39%	25%	46%	11%
Geothermal heating/cooling	27%	13%	31%	13%
Passive solar	23%	25%	24%	15%
Waterless urinals	21%	13%	25%	4%
Storm water harvesting	21%	6%	25%	6%
Environmentally Preferred Purchasing	17%	13%	19%	9%
Photovoltaics	13%	13%	14%	6%
Green (vegetable) roofs	7%	0%	8%	4%
Other	10%	0%	11%	9%

Energy management is the most popular green building concept being incorporated by respondents. Over four-fifths of respondents who indicate they have incorporated concepts into recent designs have incorporated this concept. Daylighting and automated lighting controls are other popular concepts being incorporated by respondents.

Concepts Incorporated – Other Responses

Which of the following concepts have you incorporated?

CEFPI

- *Automated ventilation.*
- *Building and site as teaching tool.*
- *Co2 and lighting sensors.*
- *Cross ventilation for cooling. Solar glass.*
- *Displacement ventilation.*
- *Drip irrigation, sub metering, environmental curriculum.*
- *Durable wall, floor and ceiling systems that decrease long term maintenance/replacement costs.*
- *Geothermal.*
- *Grey water re-use, passive ventilation.*
- *High performance building envelope, radiant floor slabs.*
- *Many features.*
- *Natural ventilation.*
- *Natural ventilation/cooling.*
- *Pervious surfaces.*
- *Solar flues/chimneys, timers on a/c plant, solar hot water, student integrated building management system.*
- *Student security measures.*
- *Super insulation.*
- *Teaching tools are part of building.*
- *Thermal ice storage.*
- *Thermal mass solar walls.*
- *We have an approved LEED designed school/implementing these concepts this year in the building of the facilities.*

NSBA

- *Soy-foam insulation.*

Impetus to Incorporate Green Elements

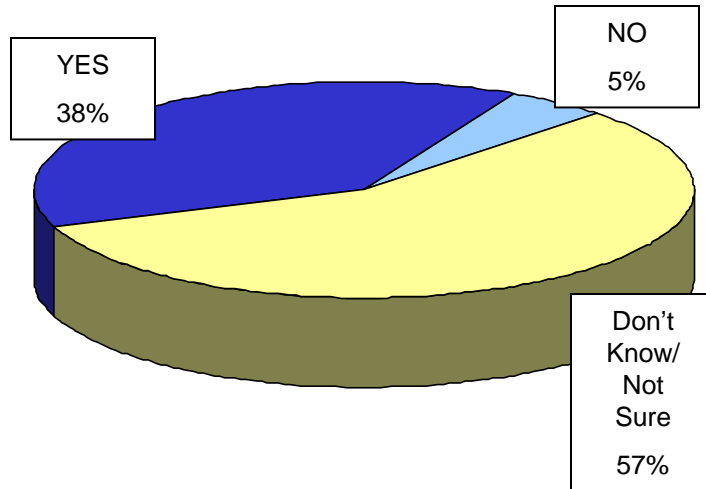
Where did the primary impetus to incorporate high performance/sustainable/green elements come from?

	Total	ASBO	CEFPI	NSBA
Architect	42%	19%	45%	35%
Facillities Planner/Director	26%	50%	25%	22%
School Official	12%	25%	10%	17%
School Board	7%	6%	6%	13%
Community	4%	0%	4%	4%
Government Requirement	3%	0%	4%	0%
Engineer	2%	0%	2%	4%
Public Official	2%	0%	2%	2%
Faculty	1%	0%	1%	2%

Over two-fifths of respondents indicate that the primary impetus to incorporate high performance/sustainable/green elements came from the architect. Over one quarter indicate that the primary impetus came from the facilities planner/director.

Improved Student Performance

If you have used High Performance/Sustainable/Green concepts in your building projects, do you believe they have improved student performance?



	Total	ASBO	CEFPI	NSBA
Yes	38%	44%	41%	18%
No	5%	0%	3%	14%
Don't Know/Not Sure	57%	56%	56%	68%

Nearly two-fifths of respondents believe high performance/sustainable/green concepts in their building projects have improved student performance. CEFPI and ASBO members prove to be stronger in their belief that these concepts have improved student performance. Nearly three-fifths, overall, aren't sure what impact that these concepts have had on student performance.

Data/Evidence to Prove Improved Performance

If yes, do you have any data or other evidence to prove this one way or the other?

	Total	ASBO	CEFPI	NSBA
Yes	24%	33%	24%	14%
No	76%	67%	76%	86%

Among respondents that believe sustainable/green concepts have improved student performance, nearly one quarter have evidence to support it.

Data/ Evidence to Prove Improved Performance

If yes, do you have any data or other evidence to prove this one way or the other?

ASBO

- *Anecdotal more than objective data. We incorporated a student/teacher design team on our most recent addition to the high school. Involvement by many groups allowed user buy-in and allowed some education of students and staff to understand what benefits were hoped for based on certain design and component selections. The comments, attitudes and behavior of students and staff as they utilize the newly added library space at the high school all indicate an increase quality of use. The utility bills to maintain the new space have been minimized by the use of natural light and high efficiency components and design.*
- *Seen studies on internet.*
- *We have not actually built this design yet. I suspect most of the green initiatives will be eliminated during “value engineering”.*

CEFPI

- *Actual test scores are higher than other schools in the district.*
- *Actual tests stating students learn more and faster.*
- *Anecdotal so far – schools have noted good student performance.*
- *Available research.*
- *Available studies suggest day lighting has been documented to improve performance.*
- *Currently participating in a doctoral dissertation which is considering the measurement of changes in student ‘attitudes to learning’ and student ‘motivation to learn’ after moving into a new school building on the old site, within a two year cycle of renewal and refurbishment.*
- *Currently working with U of North Texas on study & effects sustainable on McKinney, TX, Roy Lee Walker Elementary & 3 sister sustainable schools.*
- *Much has been published to support the tie to good design with good & appropriate materials and increased performance.*
- *One K-8 school has changed from 83% attendance to 97% attendance, including teachers and staff. Students can not wait to return to school.*
- *No conclusive analysis.*
- *No validated data yet, but students and staff love the new buildings and improved older buildings.*
- *Not implemented long enough to know.*
- *Not produced by this office.*
- *Research that has been done on lighting, carpeting, etc.*
- *Response from teachers and administrators. No hard number studies.*
- *Soon – one of our schools, which opened in Sept. 04, has high noise abatement design due to its proximity to the airport. It will be 3rd-party tested this year, as it is backed by a federal and port grant. Evidence of its effect on education will take awhile.*

Data/ Evidence to Prove Improved Performance

If yes, do you have any data or other evidence to prove this one way or the other?

CEFPI

- *Specifically no, as we have just opened our first school and second school is finishing the design phase. As we use the school I do expect to be able to monitor improvements in attendance, scores, livability, etc.*
- *Students participate in a post-retrofit evaluation of school facilities. BC hydro, the electrical utility company, was instrumental in setting up the 'power smart students program'. Energy management studies have been done in conjunction with our career preparation councilors and facilities department.*
- *Subjective commentary from users, no specific or hard data.*
- *Teacher support because facilities support the curriculum and pedagogy.*
- *The evidence has not been statistically analyzed to account for all variables, but standardized test scores rose fairly dramatically over the first year after one of our high performance schools opened. The high performance features certainly didn't hurt.*
- *Under review.*
- *We have the educational research from NCEF on various green concepts, such as natural light, indoor air quality, etc. Formatted for our clients in an easy-to-read series of charts. This research proves conclusively that incorporating some of these concepts improves teacher and student performance.*
- *We show 100% passage of achievement test at one of our schools using green concept.*

NSBA

- *Heating and a/c more even throughout the bldg. A more comfortable environment allows children to concentrate.*
- *Newer buildings tend to create strong community and school collaboration and partnership that aids in student performance.*
- *Only available data is that discipline offenses are down, far fewer than before.*
- *Our district has two high performance schools currently under construction and a third in the planning process. The first two will open in the fall of 2005.*

Leading the Green Effort

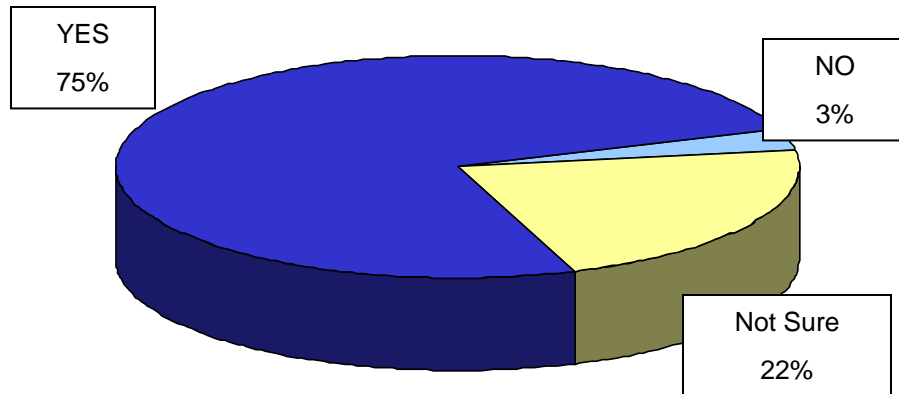
If High Performance/Sustainable/Green concepts are worth pursuing, who, in your opinion, should lead the effort?

	Total	ASBO	CEFPI	NSBA
Architect or Engineer	36%	27%	35%	41%
School Administration	25%	30%	27%	20%
School Board	24%	30%	23%	25%
Public	6%	0%	6%	9%
Faculty	1%	3%	1%	1%
Other	8%	10%	9%	4%

Over one-third of respondents feel that the architect or engineer should lead the effort in pursuing high performance/sustainable/green concepts. Roughly one quarter think the school administration or school board should lead the effort.

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?



	Total	ASBO	CEFPI	NSBA
Yes	75%	73%	80%	61%
No	3%	0%	3%	3%
Not Sure	22%	27%	17%	36%

Three out of four respondents believe high performance/sustainable/green schools can serve as a teaching tool for students.

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

ASBO

- *B&G working with student organizations.*
- *By using the building as a teaching tool across many subject areas.*
- *Ecology, architectural design, society issues and science are taught daily in schools. To actually use the principals which are taught in a real application gives greater importance to the subjects, allows students to learn how occupants interact with their building environments, provides additional opportunity to educate students on how to understand and use the new designs and processes and provides seeds of awareness that will permeate outside the school walls as students build their own homes, businesses, careers, etc.*
- *Hands on science activities, student monitoring of bills.*
- *It sets a good example for environmental responsibility.*
- *Living model.*
- *May be incorporated into curriculum and instruction at school site.*
- *Science, engineering, and drafting.*
- *Systems can serve as models to study for sustainability and energy conservation- eco friendly.*
- *Teach the students about taking care of our environment and resources.*
- *Teaching students that the district practices the environmental tenets that are taught in the schools.*
- *They (the students) are impacted firsthand with procedures that teach how we are trying to save our planet. This exposure makes a forever impact on their lives. The old adage about 'learning through osmosis'.*
- *To teach conservation and renewable energy as well as the importance of being sensitive to the impact we have on the environment.*
- *Visual examples could be witnessed by students. This will reinforce the importance of high performance schools, which ultimately will make the students/public more aware of the benefits and increase their desire to see more applications.*
- *We have to establish equipment etc. that students can actually use, for example dials placed in areas where students can actually monitor the energy being used etc. Aligning some of the teaching opportunities with curriculum.*

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

CEFPI

- *All buildings should be a familiarization tool for energy-conscious decision-making in later life.*
- *All phases of indoor air quality, day lighting, sound enhancement, etc. can and do serve as a teaching tool. Environmental education can take place outdoors at any environmentally sensitive school site.*
- *Any environment can serve as a teaching tool, even poor or bad environments. Many different kinds of experiments can be developed to teach concepts of cooling/ventilation/heat gain, artificial vs. natural lighting, how site design effects affects building performance, etc. The concepts of HP/S/GS have been around for many years and I believe that conscientious architects have been incorporating these concepts when they can. However, the concepts must be embraced by the local school boards. They establish the goals and objectives of any project. The a/e is in the best position, hopefully a partner, to suggest and show them how these concepts can best be incorporated into the design.*
- *Applying walking tour mechanisms where students and teachers can tour the building: - incorporate outdoor teaching courtyards - develop spaces to grow vegetables - protect areas for viewing natural habitats - maximize pedestrian pathways from residential areas to the school - use explanatory signage for different plants and trees - make daylighting strategies and treatments obvious - establish deliberate connections to the outdoor environment so that changes in weather are apparent and become stimulating to students - incorporate sundials as educational tools on solar arrangements - utilize prisms in focal areas to celebrate sunlight while educating students about light - incorporate photovoltaic lighting for parking lots, walkways, and signal and caution lights - expose parts of the mechanical system so that heating and cooling processes can be explained. If the school is located in an environmentally sensitive location, an interpretation center should be part of the program.*
- *As demonstration projects to be involved with the design and modeling of the project. To actively participate in the analysis of system designs and later during occupancy be part of the measurement and verification of recycling, water/energy consumption and power generation. As model projects to teach current and future generations the value of sustainable development.*
- *At least as a model for how to build with concern for limited resources, to maximize occupant satisfaction, and protect investment.*
- *At the very least as a demonstration of good design principles.*
- *Bio-ecological lessons.*
- *Buildings should always pose interactive opportunities for our kids.*
- *Critical to successful integration of facility / teaching and learning are: 1. Continuous involvement of educational professionals in facility planning 2. Professional development 3. Curriculum mapping and monitoring 4. Establishing a relationship between this specialized application of teaching / learning/ curriculum and state standards.*
- *The principles behind the use of sustainable materials and design can be taught to students and they can apply them to other aspects of their life such as product packaging, alternative fuel vehicles, solar energy, water conservation and many other areas of daily life.*

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

CEFPI

- *Get students aware of green elements such as storm water harvesting, natural daylighting, recycling, etc. by incorporating those elements into the building so that students experience those elements firsthand everyday.*
- *Green principles must be ingrained as typical design tactics in our youth, as a responsible means to achieve better buildings.*
- *Have monitoring available for inclusion into the curriculum.*
- *Help demonstrate reusing resources to meet the daily demands of life without consuming new resources and generating more waste than is necessary.*
- *High performance /sustainable/green schools form a direct link between the physical environment and various experiences which are directly observable by the student. As such it can be a vehicle for mathematics, science, essays, and civics. The students can readily observe the effect of climate, their own actions, and building on their environment. These observations can take these areas of study out of the realm of abstract learning and into direct application to the world in which we live.*
- *How student involvement can augment energy/water savings.*
- *I believe that we should be doing more of this because we need to teach students and teachers how to use and conserve energy in their homes, and as they graduate, in their businesses. I wish that every school district had either a staff member or consultant that was responsible for going to each school every year and talking with the students about energy usage and conservation and teaching them about ways that they can help (both at school and at home).*
- *I feel many aspects of the design can be incorporated into learning tools, similar to multiple intelligence teaching methods being designed into a final design solution. Geometry, physics, recyclable material usage, lighting design, etc. Are all aspects of a final design solution that can assist in a student learning about life.*
- *I think it illustrates to students a different view of how to approach living and learning in a world with an increasingly challenged environment.*
- *Importance of building impact on environment.*
- *In a variety of ways. A friendly and accessible building 'user's guide' can highlight strategies incorporated into the building and site. Environmental signage and graphics can point out features that enhance sustainability. The 'story' of the building can become a part of the culture of the school and increase awareness of environmental sensitivity. The site can be used in more creative ways to provide a greater variety of learning environments than is traditionally offered, while educating students about the site's connection to regional resources and geographical features.*
- *By demonstrating HP/sustainable/green concepts in building design, materials, systems, and equipment selections.*
- *By exhibiting stewardship of the environment and energy consumption.*
- *By exposing and labeling some of the systems components, and by providing a permanent exhibit/display that explains the strategies utilized.*

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

CEFPI

- *New harmony primary school south of Perth has energy data and analysis showing on digital displays in each teaching block, solar walls that are viewable and can be felt (by touch with a hand notice a clear difference in temperature compared to traditional walls), water tanks have easily visible gauges showing water stored, recycled water applied to reed beds (fenced but observable), etc - all these are valuable teaching resources that can be integrated into lessons in many ways.*
- *Opportunity to visualize numerous concepts at work.*
- *Practical examples of what is possible. Every physical feature can be used for learning.*
- *Provides future generations with strategies and awareness of the responsibilities associated with energy usage and resources.*
- *Putting sound conservation principles into practice.*
- *Review articles on Roy Lee Walker Elem., located in McKinney, TX. Or contact show group architects, Dallas, TX.*
- *Save the environment. Ps: cost for certification levels must come down, districts cannot justify cost.*
- *Several classes could be involved in this, especially at a high school level. Shop classes could take advantage, math class (determining energy cost savings) business classes (justify the cost through a business case analysis), the science classes, such as physics and/or general sciences.*
- *Shapes, sizes, designs, water conservation, natural lighting and students test scores, landscape designs for a cleaner environment, etc*
- *Showing how the building was built, systems used and the consequences of the choices made might raise consciousness about the importance of being 'green' for the protection of future generations.*
- *So that the students can learn the process and implement in their lives.*
- *Student involvement in conservation measures. They would become part of the solution in energy management of the facility. The facility can become a research model for rain water harvesting, etc.*
- *Students are very interested in the design and building process and they are a good tie to the older / parent who is often out of the learning curve.*
- *Students can be involved in monitoring as part of science curriculum.*
- *Students can learn the value and impact on their environment by learning to monitor energy costs and exploring how the school they attend impacts our everyday lives.*
- *Students can see and understand the benefits of green architecture first hand. They will also begin to take this knowledge with them, that is, they can then practice these skills at home with recycling, water conservation, etc. Ultimately, all generations will be well versed at sustainability issues. (I am a LEED AP).*
- *In many ways it creates an environment that trains a lifestyle.*

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

CEFPI

- *Students see real life examples of how resources are conserved or used and can apply those concepts later in life or in their personal practices.*
- *Students will get to buy into improving their future and their children's future. Also, caring about the earth, health issues, etc.*
- *Such buildings teach across the entire spectrum of education: life sciences, mathematics, sociology, history. It depends upon how much the district wishes to integrate the building as a teaching tool.*
- *Sustainable principles incorporated into building and monitoring of building systems as part of display for students.*
- *Teach students how to live within their, and the earth's, means.*
- *Teach students to be good stewards of resources, connected to energy we use, outside environment, site plantings, wetlands, etc. Teach environmental footprint and how they can make a difference.*
- *Teaching benefits of environmental design makes students and teachers more aware of the natural resources available.*
- *Teaching good stewardship and various specifics of the components and systems.*
- *Teaching how buildings work, energy usage.*
- *Teaching students the components of architecture.*
- *The building can be used as a basis of study for several classes. School papers can be written on the different sustainable aspects. Science projects and modeling can be done as well.*
- *The components and the science of those components can become teaching tools: i.e., photovoltaic and water capture systems.*
- *The design process can be use to teach students about energy conservation, recycling materials, using sustainable materials, achieving better indoor air quality, etc.*
- *The elements become teaching aids if a teacher wants to use them programmatically. If not, the sustainable buildings 'soft-teach' by example.*
- *The exposure of mechanical systems in walls and open glassed areas provide better understanding of how things work. Energy conservation reflected by the teacher with the building as a physical example is good.*
- *The future of this planet is dependent on our children and grandchildren understanding the concepts and principles behind sustainability and what better tool to teach these issues than the built environment that they experience everyday?*
- *The HPSG strategies that are part of the design of a school can be incorporated into the student curriculum at every level. One of the best examples of this is the Johnson Controls Energy Academy' program.*
- *The performance of the facility can be demonstrated on site, by direct measuring and monitoring of, for example, energy use.*
- *The principles behind the use of sustainable materials and design can be taught to students and they can apply them to other aspects of their life such as product packaging, alternative fuel vehicles, solar energy, water conservation and many other areas of daily life.*

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

CEFPI

- *They can learn about the concepts of energy management/conservation and see how it works.*
- *This is a major focus of our practice. Using the building as a tool for environmental awareness in all aspects and possibilities.*
- *Tie into their classroom topics.*
- *To educate the students on the value of high performance schools & then be able to see the physical results of the designs so they can become champions of this environmental need in order to save our planet.*
- *To teach the need & reason for recycling, the importance of daylight, and how buildings work and use energy.*
- *Understanding the students environment, establishing lifestyle choices that conserve as opposed to disposable.*
- *Use as an educational tool. What it is, what the benefits are, etc. Educating the public.*
- *Use students and parents in the initial design and have students, parents and teachers develop a resource book about the school facility and the learning opportunities that are available through the sustainable design.*
- *Visibility of sustainable systems. Training in operation of systems for maximum benefit.*
- *We build shelter to provide a comfortable and supportive environment for our activities. As such, our buildings interact with the larger environment for us. This interaction provides a wealth of opportunities for the study our environment, our interaction with our environment and ourselves.*
- *We had photovoltaic panels placed on the roof for science labs. The students can determine the amount of power used for their classes, experiments, and returned to the 'grid' when school is not in session.*
- *We have been teaching environmental stewardship as part of the curriculum for over 10 years. We also need to 'walk the mile' in our buildings. We can also show concrete examples to students of what environmental stewardship looks like.*
- *Yes, but avoid increasing teaching staff's over-extended responsibilities. A 'plug-in' educational tool in form of guest lecturers, handouts, possibly video - one that promotes student leadership & allows the teacher to expand on if they feel they can.*
- *It could be used for math, science and physics labs if done properly.*
- *Just making occupants aware of the material and energy flows through the building is great information for a multitude of studies. Tracking real time energy and water production/consumption, for instance, can be used in math, science, and social studies classes; using food composting equipment can contribute to science, economics, and public speaking; sharing this information can be incorporated into student studies in computer graphics/web page design.*
- *The tenets of sustainable design provide opportunities for visual examples, statistical information and displayed thinking for use in math, science and environmental studies. The building design decisions can be shown as specific responses to the environment.*
- *The school's sustainable features can be used to illustrate the total interdependence of quality of life and the environment.*

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

CEFPI

- *Incorporate into science and math classes. Cultural comparisons to what other sustainable methods are being used throughout the world.*
- *Incorporate project based service learning as an integral part of the curriculum using the environment (site, building, the classroom, etc.) as a textbook. Start teaching students about their school building in kindergarten. Include them as partners in the programming and design phase. Start long before the building design phase. Include post occupancy evaluation by the students after the project is built.*
- *Incorporate science being, energy, water, resource conservation, and other high performance features into curriculum.*
- *Increase awareness of staff, students and parents of the built and natural environments, and their place within it.*
- *Integrate practical examples with curriculum.*
- *Interactive computer display of dynamic functioning of the school -educational displays explaining green features in the school and environmental benefits -gauges, read-outs showing building performance.*
- *Involve students in facility planning of new or modernizations. Involve them in maintenance/monitoring systems (part time jobs?). Incorporate as part of curriculum for environmental studies.*
- *Land labs/wetlands in lieu of green houses recycle and reuse of natural resources energy conservation and management indoor air quality psychology: natural daylighting, physical environment.*
- *Lesser operating costs allow funds to be reallocated to student needs.*
- *Maintaining and monitoring many of the sustainable elements in the building, and integrating the results into various student studies.*
- *Make part of a learning model, let students help track results from year to year.*
- *Many ways. Monitoring building performance for science. Recycling materials. Identification of the source and location of raw materials and manufactured items. Where are material dollars being spent?*
- *Creating features that can be used to support education programs: local plant life on the site; exposed mechanical components; metering and monitoring.*
- *Demonstrating real environmentally friendly activities and that they work. Important that they work properly. A 'toy' system that doesn't deliver real benefit may teach students that environmentally friendly activities are a gimmick.*
- *Discussions during design, and demonstrations after occupancy.*
- *Elements of the design serve as a tool for education if the elements can be related to the course of study, particularly industrial arts and science programs.*
- *Energy consumption monitoring could be used by the science department. Green roofs could be monitored by the horticulture dept.*

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

CEFPI

- *Environmental classrooms, gardens, students classrooms with energy monitoring equipment.*
- *Environmental studies are typically not part of the formal school curriculum. Anything that can demonstrate the relationship between the natural and built environment and the role we play as stewards of those environments can serve as a useful educational tool for students in developing a broader world view.*
- *Establishing a healthier environment means in all our building types - teaching the next generation to expect a built environment that fosters their health and that of the environment will spur a better overall effort to better integrate natural resources into our built environments.*
- *First by providing a pleasing, quality environment for learning. Various aspects of high performance incorporated into the building can be illustrated and highlighted so kids start to see those features as standard. Unfortunately some of the highly visible features such as water recovery and green roofs are the least cost effective and/or don't provide reasonable payback.*
- *By getting kids used to the design concepts. i.e., if they grow up using waterless toilets then they might be more comfortable with them in a professional environment.*
- *By illustrating the concepts that students are learning in the class work.*
- *By making visible how energy is saved and managed. Hopefully, this visibility will also lead to awareness by students.*
- *By providing examples of buildings that are more than just accommodation. By demonstrably improving student health, safety and learning. By providing a learning tool about the environment. Hp schools will help counteract the effects of the 'disposable, throw away society that we have allowed to contribute to a lack of respect for those things that serve us, including people. They might convince governments that there is a better way than simply using up non-reusable resources such as fossil fuels, water, air and soil.*
- *By teaching innovative thinking utilizing real-life demonstrations (the building itself) and hands-on learning through forensics (building systems analysis). The more 'real' the subject matter becomes the more the enhanced learning becomes 'real' thinking.*
- *By using not only the inside of the classroom but the whole campus as a teaching tool. By using the building as a teaching demonstration project or projects for learning about high performance/sustainable/green buildings and serving as a yardstick for comparing other buildings especially schools.*
- *Can be tied to social studies and science curriculum.*
- *Children are intellectual sponges. They want to know everything. The more that they understand how the environment works around them the better citizens they will be when they grow up.*
- *Concepts can be used to teach conservation and reuse of materials.*
- *Concepts for green design have connections to science/health related activities that can enhance teaching / curriculum.*

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

NSBA

- *Become more familiar with the environment.*
- *Best practices/cost benefit analysis/environmental awareness.*
- *By being a positive example, of not only energy savings, but also helping to create a sustainable future. Patrons need a push, and educating them certainly will help.*
- *By giving them exposure to concepts that they otherwise might assume would be inconvenient or uncomfortable.*
- *By making our students aware of our environment, and safeguarding our future.*
- *Can be incorporated into lesson plans of the teachers.*
- *Conservation of limited resources.*
- *Demonstrating that this type of construction can be done, showing them what HP/S/G means and how it works.*
- *Demonstration of technology and integrated design.*
- *Energy management and resource management, flows directly into science and math. The issues at the H.S. could include sociology as well as comparison (historical) of what was done in the past as well as what is done in other countries.*
- *Fits with several courses and NYS learning standards.*
- *Greater involvement and embracing lends to greater community collaboration, appreciation and support for student success and achievement.*
- *If done right, students can learn about their effect on the environment and how to recycle properly.*
- *If student see adult's being concerned, they will also be concerned, show respect for environment.*
- *Involvement in the project from design to completion in a variety of different class types.*
- *It would not be the priority. Our schools are K-8. Would be more appropriate at a high school.*
- *Learn how and why it's being done.*
- *Many science topics correlated.*
- *Part of educational process to teach students ways to be more environmentally friendly.*
- *Teachers could educate the students on the need and how to conserve energy and protect the environment.*

Green Buildings as Student Teaching Tool

Do you believe High Performance/Sustainable/Green Schools can serve as a teaching tool for students?

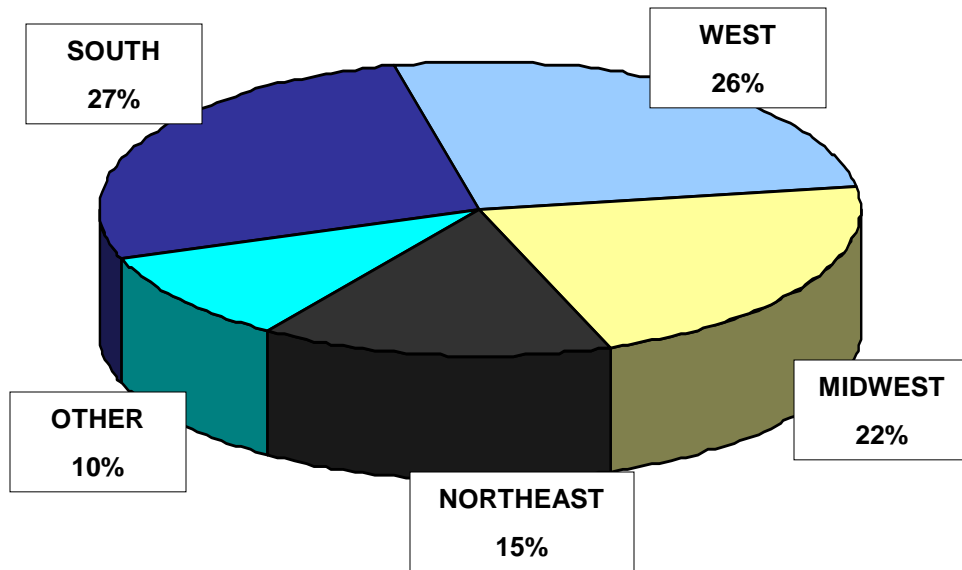
NSBA

- *There are relevant topics for health class (asthma can be caused by toxic building materials), social studies (social responsibility for pollution/overuse of resources by the US compared to the rest of the worlds, .etc.), economics (initial cost vs. Long term energy savings), sciences (physics of how energy efficient glass works; environmental ramifications of a green movement). These are only a few.*
- *They will be inside the environment that creates the learning experience. The students can be taught why the building is constructed in this fashion. This instruction can build both pride in their facility as well as create and understanding the all of us need to be conscious of protecting our natural resources.*
- *We have a great student building program in our district. Much could be learned from this type of construction and planning.*
- *We teach about green building design in our technology/architecture and design class. Such a school building could provide examples.*
- *When staffing our new high performance elementary school we are having as a condition of employment a commitment to the green concepts of the building. It is our intent to have a number of building learning activities focus on the tenets of high performance schools.*
- *Teaching students about the environment in which they live, current risks to their environment, and available and potential changes in lifestyle and technology to address those risks is (or should be) integrated throughout the K-12 curriculum.*
- *The buildings and grounds themselves are daily examples of scientific and social principles.*
- *The science behind the design allows for real world examples of innovation and cost effectiveness for students, staff, and community.*

II: Demographics _____

Regional Breakdown

In what state are you located?



<i>By respondent group</i>	TOTAL	ASBO	CEFPI	NSBA
South	27%	13%	30%	24%
West	26%	27%	28%	19%
Northeast	15%	20%	12%	25%
Midwest	22%	37%	17%	33%
Outside US	10%	3%	14%	0%

School Description

How would you describe your school district?

	TOTAL	ASBO	CEFPI	NSBA
Suburban	53%	43%	55%	49%
Urban	28%	23%	34%	11%
Rural	20%	33%	10%	41%

Is your school system:

	TOTAL	ASBO	CEFPI	NSBA
Public	98%	100%	97%	98%
Private	2%	0%	3%	2%
Parochial	0%	0%	0%	0%

Student enrollment (total for your district)

	TOTAL	ASBO	CEFPI	NSBA
Less than 1,000	6%	10%	4%	11%
1,000 - 2,499	11%	13%	4%	29%
2,500 - 7,499	24%	40%	17%	36%
7,500 - 14,999	16%	20%	18%	12%
15,000 or more	42%	17%	57%	12%
Mean	11,208	7,658	13,576	5,911

Job Title

What is your title?

	TOTAL	ASBO	CEFPI	NSBA
Architect/designer	30%	0%	44%	0%
School board member	15%	0%	0%	65%
Facilities director/manager	11%	17%	14%	1%
Superintendent/administrator	9%	13%	3%	27%
Construction/capital projects manager	6%	0%	8%	0%
School business official	5%	57%	2%	1%
Consultant	4%	0%	6%	1%
Facilities designer/planner	3%	3%	4%	2%
Engineer	3%	0%	4%	0%
Manufacturer/supplier	2%	3%	2%	0%
Contractor	1%	0%	1%	0%
Facilities operations & maintenance staff	0%	0%	1%	0%
Other	9%	7%	11%	3%

Responsibility for Functions

For which of the following functions do you have responsibility?

	TOTAL	ASBO	CEFPI	NSBA
Facilities design	67%	50%	81%	29%
Facilities planning	65%	63%	73%	44%
Construction management	43%	53%	48%	24%
Budget	39%	80%	30%	55%
Administration/Operations	31%	73%	20%	48%
Facilities maintenance	27%	70%	23%	25%
Property acquisition/management	26%	57%	18%	38%
Finance	17%	67%	4%	41%
Legislative affairs	15%	23%	4%	48%
Transportation	15%	57%	7%	28%
Labor relations	15%	33%	4%	43%
Human resources	15%	33%	4%	40%
Legal affairs	14%	40%	4%	38%
Food service	14%	57%	6%	23%
Information systems	12%	37%	6%	24%
Accounting	11%	67%	4%	15%
Other	14%	3%	11%	27%