Nevada Policy Research Institute
analysis

Do 'green' schools live up to the sales pitch?

by Todd Myers

Executive Summary

The push to build "green" schools is showing itself in states across the country. While environmental groups argue "green" building standards like Leadership in Energy and Environmental Design (LEED) save money, research demonstrates that the results don't match the promise.

In this report, we examine green schools in Nevada's two largest school districts — Clark and Washoe counties — to compare their energy performance to others in the same district.

Unlike other states, Nevada school districts have avoided the pressure to meet LEED and other, similar, standards. Each district, however, has schools the districts say are influenced by those standards. Analysis of those schools reveals that adherence to LEED standards doesn't yield the promised savings.

In Clark County School District, the green elementary schools' record is mixed. While more efficient than other CCSD elementary schools, the cost of that efficiency appears high, suggesting a relatively poor use of education funding.

Washoe County School District specifically decided not to meet the more stringent LEED standards when building Depaoli Middle School, due to cost concerns and the difficulty of meeting the standards. The school's additional cost, therefore, is likely to be lower than typical.

Despite Depaoli's use of LEED-inspired construction elements, however, the school is less efficient than two recently built non-green schools. As a result, Depoali will not recover even its limited additional costs.

Nevertheless, the failure of these schools to meet promised energy savings may actually reflect positively on district staff. Despite environmental activists' claims, schools are fairly efficient already. Thus the marginal benefit of building to the "green" standards is actually minor.

When looking to remodel or build new schools in Nevada, school boards should consider the high costs and low benefits of green schools. Just because standards are promoted as "green," doesn't mean they actually are.

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Introduction

When Roche Constructors finished building Vincent L. Triggs Elementary School in Las Vegas in 2010, the contractor proclaimed that Clark County's newest "green" school would dramatically lower energy costs and help the environment.

"Before the school was even opened to the students," a Sept. 15 press release said, "it was boasting a 67 percent improvement in efficiency."[1]

After four years of operation, however, how does the school's performance hold up?

The record is mixed. On the positive side, Triggs Elementary has the lowest cost for energy per square foot of any elementary school in the Clark County School District. During the 2012-13 school year, and the first half of the 2013-2014 year, Triggs spent $1.40 per square foot for electricity and natural gas.

But rather than achieving a 67 percent improvement in efficiency as claimed by the contractor, Triggs achieved only about half that goal when compared to other elementary schools built elsewhere in the district since 2007. But the question for school districts is: At what cost were those savings achieved? The reported cost to build the school was $14.2 million.[2] If the green elements are typical, their cost added about two to three percent to the total – about $426,000 to the price of the building. Even with the significant efficiency savings compared to other schools, it would take about eight years for the district to recover an additional two percent cost of construction, which is on the fringe of what is considered a reasonable time to recover such costs.

Across the country, school boards look to build "green." Pushed by the U.S. Green Building Council (USGBC) and environmental activists, school board members are told that following the rules of Leadership in Energy and Environmental Design (known as LEED) and other green standards will yield huge energy savings for almost no additional cost.

Research shows, however, that this is not the case.

Triggs Elementary performed relatively well when compared to other schools across the country, and to other green schools in Clark County. For example:

- In Spokane, Washington, none of the new green elementary schools were as energy efficient as the traditionally built Browne Elementary School. One of the supposedly green schools actually used 30 percent more energy than Browne.

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[1] Roche Constructors, "Grand Opening of Vincent L. Triggs Elementary School," September 15, 2010, http://constructioncosts.net/dyn/news_singleArticle.cfm?id=52 (Accessed October 7, 2014)

[2] Southwest Contractor, "CORE to Build New Elementary School," December 2008, http://southwest.construction.com/news/NV/archive/0812.asp (Accessed October 7, 2014)

- In Santa Fe, New Mexico, the facilities director reported the school district will not build another green-certified building anytime soon after the first such building, Amy Biehl Community School, consistently incurred some of the highest energy costs in the district.[3]
- *USA Today* found that green schools perform poorly in Houston as well. The newspaper reported, "Thompson Elementary ranked 205th out of 239 Houston schools in a report last year for the district that showed each school's energy cost per student. [Green school] Walnut Bend Elementary ranked 155th."[4]

In Nevada, Clark and Washoe County School Districts have not gone as far as others, choosing not to pursue LEED certification. Instead they have simply incorporated green elements in new school design. This has proven a more successful approach in other states, avoiding the costs of meeting LEED certification. It provides facilities directors more control in determining which added costs are worthwhile and which are not, rather than having to meet the somewhat arbitrary point system required by LEED. For example, in Washoe County Schools, one school considered seeking LEED certification, but decided against it since the location was near a wetland.

Of course not every green school performs poorly. Some green schools are more efficient than their counterparts in the same district. Even when that is the case, however, green schools are often more expensive to build and operate than traditionally built schools, making it questionable whether they really save money for the local school district.

In this report we examine green schools in Nevada's two largest school districts – Clark County and Washoe County – to compare the energy performance of those schools to others in the same district. Schools provide a good opportunity to assess green building standards in general because schools tend to be about the same size, have the same building elements, are located in the same climate, and a number of similar buildings are nearby to provide accurate comparisons.

Do Green Schools Live up to Their Promise?

Advocates claim green schools provide many environmental benefits. The USGBC defines a green school as "a school building or facility that creates a healthy environment that is conducive to learning while saving energy, resources and money."[5] Many of these points are subjective

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[3] Santa Fe School District, "Santa Fe Pubic Schools Energy Benchmarking Report," October 8, 2012, http://www.sfps.info/DocumentCenter/View/7049 (Accessed August 8, 2013)

[4] Frank, Thomas, "Green schools: long on promise, short on delivery," USA Today, December 11, 2012 http://www.usatoday.com/story/news/nation/2012/12/10/green-schools-construction-leed/1753823/ (Accessed August 8, 2013)

[5] Colorado Chapter USGBC, "Colorado – USGBC," http://www.usgbccolorado.org/green-buildings/GreenSchoolsColorado.html (Accessed August 8, 2013)

judgments that are difficult to measure. Efforts to link the supposed health benefits of buildings and the learning progress of students are vague and subject to many other influences.[6]

Energy use and energy costs, however, are useful and objective metrics that can be easily measured and compared. Since a reduction in energy use is at the center of what it means for a building to be green, this is the most useful way to compare the actual environmental results of these schools to traditionally built schools. Additionally, this study compares schools built recently in the same area. The question is not whether new green schools are superior to old, traditionally built schools. The important question is whether spending more for a new, green school will yield cost and energy savings compared to a new, traditionally built school. Stated another way: Does the energy use of green buildings justify their significantly higher construction and operating costs?

Using this metric, the green-schools-in-Nevada performance is "some good, some bad." Both districts have at least one school classified as green, although neither district has any LEED-certified schools. Those schools are more efficient than other recently built schools in the district, but assuming an additional three percent construction cost to meet these standards, none of the schools will recover those additional costs through energy savings in less than ten years.

At a time when money for education and for protecting the environment is scarce, state legislators and policymakers should look closely at green schools and question whether policies that promote or require those standards actually deliver the promised benefits.

What are Green Buildings?

Before examining the performance of green schools in Nevada, it is important to know what the term means. Although definitions vary, the most common standard for green schools is the Leadership in Energy and Environmental Design (LEED) system created and promoted by the USGBC.

To meet the LEED standard, building designers must accumulate points in a number of categories. The LEED checklist for schools[7] includes categories for:

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality

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[6] For example, test scores vary widely from school to school and measuring the impact of the school building as opposed to socioeconomic or other factors is virtually impossible.

[7] U.S. Green Building Council, "Schools v2009 Checklist," http://www.usgbc.org/resources/schools-v2009-checklist-xls (Accessed August 31, 2013)

- Innovation and Design Process
- Regional Priority Credits

Points are awarded in each category and if a school design receives 40 out of a possible 110 credits, it is certified as green. At 50 points a building achieves LEED Silver status; at 60, LEED Gold; and at 80, LEED Platinum, the highest rating.

Currently, there two LEED-certified schools in Nevada: the Miley Achievement Center and the Northwest Career and Technical Academy, both in the Clark County School District. Neither school is a traditional school and both have elements not common to other schools. As a result, we have not included them in our analysis. Our experience elsewhere in the country demonstrates that comparing non-traditional schools to traditional school buildings yields results that are unreliable.

Although there are only a few LEED-certified schools in the district, buildings designed using green elements are often influenced by LEED. On the other hand, green buildings that do not meet the LEED standard avoid unnecessary costs that are often required to achieve the point totals required by the LEED system.

As we will see, the flexibility of adding green elements without having to meet the restrictive LEED standards allows Nevada school districts to improve energy efficiency in a more cost-effective way. Even with that flexibility, however, some green schools are still marginal when it comes to the additional cost of a building compared to energy savings it produces.

Clark County School District

The Clark County School District[8] has four elementary schools built to what they consider green standards – all of them built in 2010. None of the four schools – Duncan, Stuckey, Triggs and Wallin – have been given official LEED certification, but the district lists them as having been built to "LEED/Green standards."[9]

To ensure our comparisons are apples-to-apples, we have compared Clark County's green schools to the performance of other elementary schools in the same district, opened in the last decade. This includes a total of 39 traditionally built schools and the four green schools. This also includes schools with a wide range of energy costs.

This approach allows more confidence when comparing schools, but caution must always be used when making specific comparisons and must recognize differences specific to individual schools. For example, the second-most efficient elementary in Clark County is Adams

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[8] Clark County School District, http://ccsd.net/

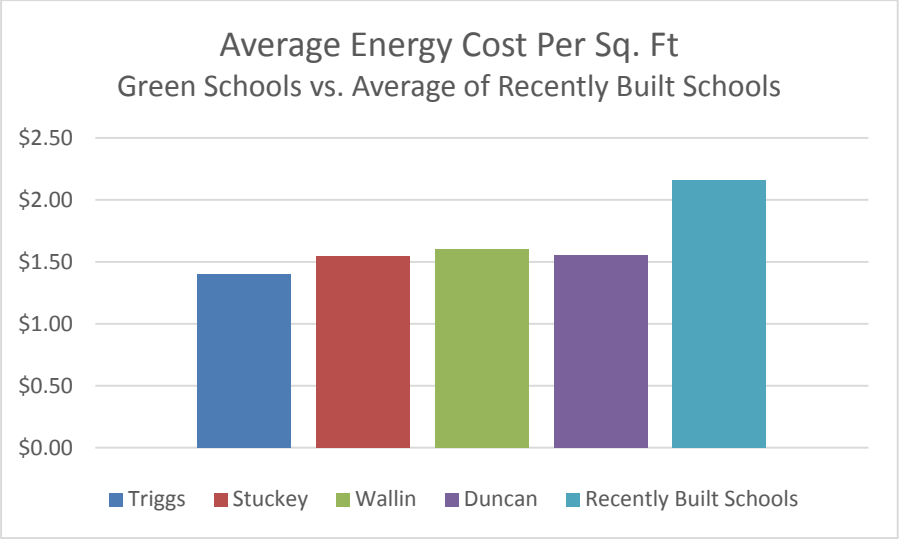
[9] E-mail to author from Clark County School District, Cynthia Smith-Johnson, Public Records Officer, August 18, 2014, available upon request.

Elementary, built in 1991. The school, however, is built partly underground – a design feature that significantly reduces energy costs. As a result the building may be more energy efficient, but may lack other amenities desired by school officials. Any comparison, therefore, recognizes tradeoffs. As noted above, however, we focus on energy efficiency because that is at the center of what it means to be a green school.

Clark's Green Elementary Schools

Four schools were built to green standards in the district in 2010 and school officials predicted they would be significantly more energy efficient. The contractor for one of the schools, Triggs, noted that before the building opened, it had a 67 percent "boost in efficiency." The claim did not indicate what that boost in efficiency was compared to, but the data from the district tells another story.

All four of the schools are more efficient than the average, recently built school in the district. Of the 39 traditionally built schools in the district, the average cost for electricity and natural gas/propane is $2.16 per square foot for the 17 months beginning in July 2012.[10] In comparison the green schools spent only $1.53 per square foot for energy during that period of time; They were thirty percent more efficient.



Even with these savings, the question is whether the green standards are worth the cost. Estimates vary about the additional cost to build a school to green standards. Typically meeting green building standards adds two to three percent to the cost of a building.[11] Even environmental advocacy groups, like the Natural Resources

[10] February 2014 was the most recent data available at the time of request and we chose to include part of 2014 in addition to all of the 2012-13 school year to improve the quality of the data.

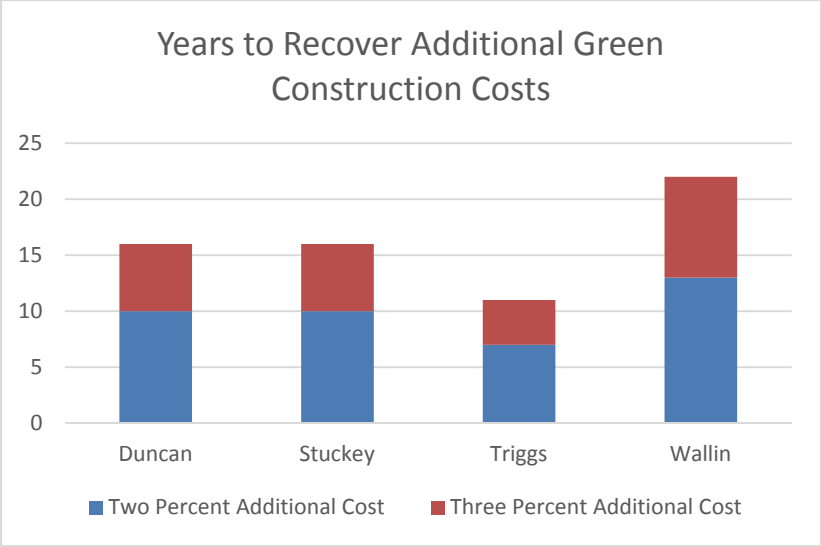
[11] Joint Legislative Audit Review Committee, "High Performance Public Buildings: Impact on Energy Use is Mixed," May 18, 2011, http://www.leg.wa.gov/JLARC/AuditAndStudyReports/2011/Documents/HighPerfPublicBuildingsPreliminary.pdf (Accessed 8/25/2013)

Defense Council, admit "real-world examples show that you can complete a LEED-certified green building project for an average of 2 percent more in upfront costs."[12] Given their strong advocacy of LEED and the fact that other studies show higher costs, that should be considered a conservative estimate.

Compared to the other traditionally built elementary schools in the district, this means building to the green standards added an estimated additional $1.4 million to the cost of the four schools. Even with the improved energy efficiency, the schools have a wide range of success with regard to paying back higher construction costs through energy savings.

Two notes are appropriate here. First, we assume a discount rate of three percent, which means a dollar saved next year is worth three percent less than a dollar saved this year. Considered another way, it wouldn't make sense to spend a dollar today to save a dollar ten years from now. While economists differ on discount rates, three percent is relatively conservative.

Second, we do not consider additional maintenance costs. Across the country, facilities directors note that many of the systems designed to save energy – such as motion sensors in rooms that can turn off the lights automatically – cost more to install and replace. Anecdotally, one facilities director lamented that replacing light switches used to cost less than a dollar, but now can cost hundreds of dollars. Many have noted that the cost of maintaining new systems is more expensive because the technical expertise to repair them requires hiring contractors, rather than using in-house maintenance staff. This is often more expensive as well. Pinning down these additional costs, however, can be difficult and they often do not appear until the building is several years old. It is worth keeping these costs in mind, however, especially if energy savings have a long timeline for return, making the additional cost of marginal benefit.



The best performing school, Triggs, saved an estimated $44,570 in energy costs per year, compared to what it would spend if its costs were average for new schools in the district. The building cost about $14.2 million to build. If meeting green standards cost an additional two percent, as claimed by NRDC, the

[12] Natural Resources Defense Council, "How Much Does Green Building Really Cost," http://www.nrdc.org/buildinggreen/factsheets/cost.asp (Accessed October 7, 2014)

additional green elements cost $284,000, making the payback time about seven years. If the additional cost is three percent, the cost goes up to $426,000 and the payback timeline increases to over 11 years. Typically, such investments are judged based on a 10-year payback, so depending on the additional cost, Triggs is near the limit of this standard.

One reason Triggs appeared to perform well is that some taxpayer subsidies were not counted. For example, the inclusion of solar power, which accounts for an estimated 10 percent of its energy, is subsidized by taxpayers, but those subsidies were not counted in the cost of the project.[13] It is like a lemonade stand where the parents buy the lemonade and the profit goes to the children. The business model for lemonade and solar panels relies on subsidies but pretends they aren't there.

The U.S. Energy Information Administration notes that photovoltaic solar is one of the most expensive forms of renewble energy, costing an average of 60 percent more than wind energy.[14] School districts often point to significant subsidies from the federal government and local utilities, claiming these subsidies make the cost of the panels affordable. Those costs, however, are still paid by taxpayers and ratepayers. Put simply, solar panels on schools are not a good investment for energy savings or the environment.

Using that same approach, the other schools fared worse. Wallin Elementary would require between thirteen and twenty-four years to recover its additional costs. Stuckey Elementary would require between ten and sixteen years to recover those costs.

Duncan also has a long cost-recovery period, ranging between thirteen and twenty-one years. Duncan was the most expensive elementary school of the four considered here, perhaps due to additional landscaping work necessary on the site. It is probably not appropriate to apply a two or three percent additional green-building cost to landscaping, so this range may be high. If the building cost was consistent with the other three schools, in the range of $14.5 million, then the payback period would be ten and sixteen years – a shorter time period, but still longer than desirable. Like Triggs, Duncan has solar panels, making this long cost-recovery period even less favorable.

Even though Clark County green schools performed better than others across the country, the district needs to keep a close eye on whether the additional costs actually pay off over time. The comparative energy savings may look good, but often the desire to be green encourages school

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[13] Milliard, Trevon, "Solar panels to be installed on roofs of three public schools

Las Vegas Review Journal, January 27, 2012, http://www.reviewjournal.com/news/education/solar-panels-be-installed-roofs-three-public-schools (Accessed October 8, 2014)

[14] U.S. Energy Information Administration, "Energy Outlook 2014,"April 17, 2014, http://www.eia.gov/forecasts/aeo/electricity_generation.cfm (Accessed October 8, 2014)

board members and administrators to ignore the larger context to see if such investments actually pay off.

Green school advocates offer a number of reasons to explain why these buildings fail to deliver the promised energy savings. We will discuss these reasons in detail below, but one argument is that even though the payback period is long, these schools offer other benefits not associated with energy savings. Labeling the schools as green, however, implies they are more energy efficient and have a smaller environmental impact than other schools.

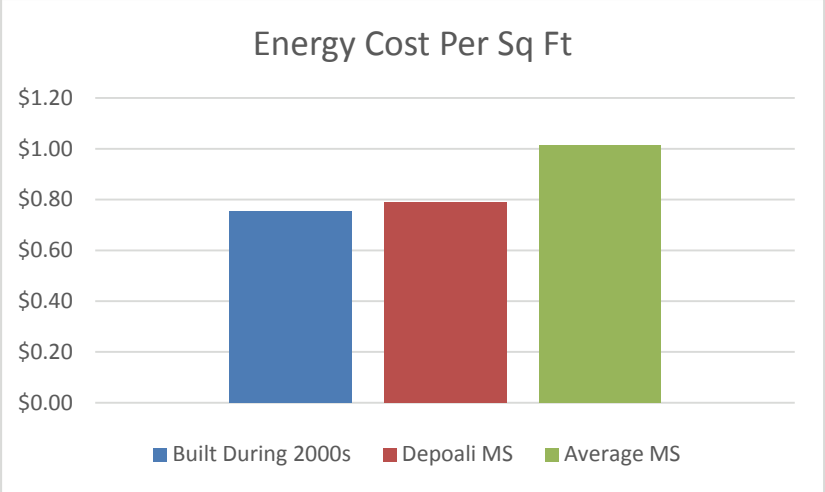
Arguments that attempt to explain away additional impact on the environment by citing added amenities demonstrates that the adjective "green" is less important than other design goals, like building comfort. Additionally, it is unlikely that schools built to green building standards in 2010 are dramatically more comfortable than schools built just one or two years earlier.

Ultimately, the performance record of Clark County School District's green elementary schools is mixed. They are certainly more efficient than other elementary schools in the same district. The cost to achieve those savings, however, may be high, making them a relatively poor use of education funding.

What is clear, however, is that there is no one-size-fits-all solution. The higher cost needed to make Triggs Elementary (with the expectation of the solar panels) energy efficient may be paying off, whereas the costs for Duncan and Wallin may never be recovered.

Washoe County School District

The Washoe County School District[15] has one middle school, Depoali Middle School, built using LEED guidelines. Ultimately the school did not achieve LEED certification because the location of the building – next to a wetland – made receiving certification difficult, in the opinion of district staff.[16] There are



[15] Washoe County School District, http://www.washoeschools.net/

[16] E-mail to the author from Washoe County School District, Chris Cobb, Chief Facilities Management & Capital Projects Officer, September 9, 2014, copy available upon request.

fourteen middle schools in the district, three of which were built in the 2000s. In our analysis we compare the green school to all other middle schools in the district and we highlight the comparison to the other two recently built middle schools, Cold Springs and Shaw, built during the last decade.

Compared to the average middle school in the Washoe School District, Depoali performed well, and is the second-most energy efficient middle school in the district. During the 2012-13 school year, the district spent 79 cents per square foot on energy for Depoali. This was twenty-two percent more efficient than the average middle school in the district.

Comparing the school to other recently built middle schools, however, tells a different story. The most energy efficient middle school in the district is Cold Springs Middle School, which spent 72 cents per square foot – nearly ten percent less than green Depaoli. Shaw Middle School, built five years before Depoali, also compared well. It tied for second-most efficient, spending the same 79 cents per square foot as Depoali. As a result, the two recently built, non-green middle schools are actually more efficient on average than the new, green school.

This is not necessarily a critique of the district's building management. In many places facilities directors have been conscious of energy efficiency, and made improvements long before such changes were labeled "green." Put simply, there might not be much opportunity to improve the energy efficiency of these buildings. Spending more to achieve a green status, therefore, is probably wasted money.

This becomes clear when looking at the cost recovery timeline for Depoali. Construction of the school came in at about $38 million.[17] Compared to the average middle school in the district, the building saved about $32,445 during the 2012-13 school year. If the green elements cost only two percent more, it would add $760,000 to the cost of the building. Using the same three percent dollar-value discount rate per year assumption as above, it will take 40 years to recover the additional construction costs to meet the green standards. If the green element costs added three percent to construction cost, it will take more than 100 years to recover the costs.

Since the school district did not go forward with meeting the LEED standard, the additional cost might actually be lower. If the additional cost was only one percent, however, it would still require fourteen years to recover the costs. These unreasonably long timelines for cost recovery look even worse when we consider that six of the district's middle schools were originally built before 1966.

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[17] PK Electrical, "Kendyl Depoali Middle School, Reno, Nevada," http://www.pkelectrical.com/index.php?page=k12-2 (Accessed October 7, 2014)

When compared to the two recently built middle schools, Depoali will never recover the additional cost because it is actually less efficient than the average of the other two schools. In 2012-13, Depoali spent $6,000 more on energy than it would have if it had been as efficient as the other two recently built middle schools.

As we've noted, this is not atypical for green schools. Districts across the country find that green schools are little better, or even worse, than other non-green schools located in the same district. This is true for schools built to the LEED standard or to other green standards. In some cases, school officials and school board members hope that becoming more green – meeting higher standards – will yield greater energy savings. The opposite is actually true. In many cases, good designers and operations managers have already picked the low-hanging fruit, making it more expensive to add additional efficiency technologies called for by LEED rules.

As the Washoe County School District considers new building construction or renovation, officials there should recognize that meeting green building standards is not a panacea and may actually increase energy costs.

Why Green Schools Fail

It seems strange that schools designed to save energy actually end up using more energy, or save so little energy that the additional building cost is never recovered. Many analysts wonder why this is so consistent among schools constructed using the LEED building standard or other green building systems.

The primary problem is that school district officials and green building designers often ignore tradeoffs by sacrificing energy savings for other desired amenities like natural lighting, air conditioning, fresh air and other benefits. Those may be nice amenities, but they usually require more energy and thus undermine the green label officials are trying to achieve, making the green building standards less meaningful or even counterproductive.

There are a few examples.

First, green building systems often promote the use of large windows as a way to provide natural light and reduce lighting costs. Some school designers argue that natural light leads to higher student test scores.[18] Large areas of glass, however, are poor weather insulators and whatever gains are achieved in reducing electricity use for lighting is lost through greater energy use to maintain a comfortable room temperature.

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[18] Districts often claim that green schools yield better test results and the increased natural light is often the source of those claims. The research behind such claims, however, is poor and analysis of green schools in Washington state using the state's own grading system finds a slight negative, but not significant, correlation between green schools and academic achievement. See "'Green' Schools Fail to Make the Grade: State Building Rules Do Not Raise Student Test Scores," Todd Myers, June 2011, http://www.washingtonpolicy.org/publications/notes/green-schools-fail-make-grade-state-building-rules-do-not-raise-student-test-scor

Second, designers claim green schools are healthier because they circulate air more frequently, reducing the risk of a "sick building" affecting its inhabitants. Constantly drawing fresh air into the building and raising or lowering its temperature to comfortable levels, however, significantly increases energy use.

Finally, unless electricity costs are very high, it is difficult to save enough electricity to recover the additional cost of constructing a school to meet the costly LEED rules or even some lesser green standards. Electricity prices may increase in the future, improving the rate of return on the up-front green construction costs, but that is speculative, and it would be wiser to simply add more wall insulation or wait and take other steps when electricity costs do actually increase. Spending now in the hope of perhaps saving money later is a risky strategy at a time when public resources are limited.

Conclusion: Reviewing the Record of Green Schools in Nevada

In the two major school districts in Nevada, the results for green schools are mixed, but even if the cost to meet these green standards is low – on the order of two percent – most of the schools have cost-recovery timelines longer than ten years. In some, if not most, cases it is likely that the additional costs to build "green" will never be recovered.

The performance of Nevada's green schools demonstrates that legislators and school officials should think twice before spending additional taxpayer dollars to earn LEED or other green certification. The experience of schools across the country demonstrates that district facilities directors are often adept at finding cost-effective ways to reduce energy use based on the particular buildings they manage. Requiring them to meet a formulaic, one-size-fits-all approach, however, often leads in the wrong direction, increasing construction and operation costs without returning meaningful energy savings.

The failure of green buildings to produce energy savings as promised is also an environmental failure. Many advocates who promote LEED or similar rating systems point to the supposed carbon dioxide emission reductions achieved by green schools. The high costs required by green schools to save energy – or, in some cases, use more energy – wastes public resources on efforts that do nothing for the environment. Instead misguided green building rules divert funding from efforts that could have a positive environmental impact in other ways, or could fulfill other needs.

Ultimately – for taxpayers, students and the environment – the data show Nevada's green schools fall short of their energy-saving promises.

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