



## Reflections on The Image of Green Buildings: An Ethnographic Evaluation of A “LEED” Certified Elementary School

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### **Abstract**

Davidson Elementary School is the first LEED certified school building in Tucson, Arizona. The school has been designed and built as a green setting based on the goals of the architect, teachers, parents and a community that has long suffered from the moldy old Davidson school building. Yet by looking at the new building and comparing it with conventional schools that have similar function and size in Tucson, one questions whether the users can distinguish differences which might be related to the building's greenness? Is the same true for many other LEED rated green school buildings in other parts of the United States? The present paper asks whether the image of a building, and even an integrated pedagogy in the case of schools, shouldn't more actively promote the meaning of sustainability. The present case is an ethnographic study, which has been done at Davidson Elementary School during the author's sabbatical at University of Arizona in 2010. The study includes analysis for the building's images, and interviews with different building's occupants and visitors. The author interviewed the school's principal, teachers, administrative staff, 4th and 5th grade students and some parents. The analysis shows that Davidson Elementary Buildings offer limited use of symbolic meanings to foster belief about sustainability; at the same time it conveys some negative meanings that might affect the wellbeing of laypeople, and obviously hindering a possible sustainable relationship between people and environment. The examination of the cultural expression of buildings' green features and the meanings acquired from them at Davidson School provides a novel ethnographic evaluation of green building design intentions.

### **Introduction**

Given the media about current and future environmental problems on our planet, one can imagine that the importance of sustainable or green buildings is very clear. This would follow from much research by planners, architects and people developing systems and tools that can help in making good sustainable built environments. In his analysis of sources of design, Orr (2006) believes that the green building movement is based on ecological patterns and the design wisdom of the previous 3.8 billion years. In some ways it reflects the intent of the earliest designers to mirror a large reality, but it is now grounded in the modern scientific study of natural systems and process of nature transposed to the built environment. One of the major green building rating systems, which evaluates green buildings based on building design and construction outcomes, is LEED (Leadership in Energy and Environmental Design). A points system and certification credits of LEED makes it a good demonstration for evaluating green buildings based on the modern scientific study of natural systems. Yet by looking at the building images of many highly rated LEED buildings and comparing them to other conventional buildings with similar function and size, sometimes one has difficulty in distinguishing the two.

Thus, do green features in green buildings play a role as a medium in communicating meanings about sustainability? If so, how are these meanings acquired, and if not, why not? Should these features be an active part of a belief system about sustainability? Beyond the technical aspects of sustainability, do what extent do architects promote cultural dimensions of the same?

Although great attention has been paid to the environmental design of school buildings in the past forty years, there has been much less interest in interior and exterior images of educational building typology. Speaking of sustainable culture more broadly, Willard (2002) argues that the values underlying sustainable development are going to increasingly play a role in organizational effectiveness. Specifically, he predicts that organizations that embrace sustainability are likely to have an advantage in recruiting and retaining young people who value the environment and whose job preferences may increasingly reflect these attitudes (Heerwagen, and Zagreus, 2005).

Similar to Willard's belief, different groups belonging to governmental and nongovernmental agencies started in the last decade to push the idea of building green schools not only to promote a healthier environment for children, but to teach them an ethic of sustainable living from the green schools themselves. In this regard, an initiative from the US Green Building Council promotes a version of LEED for schools that put extra environmental measures on school building design, construction, operation and maintenance. Moreover, a mandatory prerequisite of LEED for schools requires them to develop a curriculum to use buildings as learning tool, developing a link between the technical aspects of green buildings and its cultural image. Thus, behind the physical objectives of many rating systems, that arose in the field of sustainable building design involving every technical detail of green buildings, may lay cultural images of both positive and negative potentials in terms of an effective culture of sustainability. The present investigation analyzes what green features, in Davidson Elementary School, convey cultural images to laypeople.

## **Background**

### **The Image of Green Buildings as Cultural Expression**

Architects have long thought that the style of a building conveys social meanings and affects emotional experience (Nasar, 1998), also Nasar (1989) found that styles conveyed common meanings across adult respondents from Columbus, Ohio, and Los Angeles. Meaning is the mechanism that links environments and people (Zwarts & Coolen 2006; Rapoport, 1988). More broadly, people experience meaning in the beliefs they hold, the actions they take, and the feelings that results (Connor and Chamberlain 1996).

People express their culture in different ways, attaching meanings to objects based socially motivated symbolic strategies. This is a normal reflection of an integrated pattern of their knowledge, belief, and behavior that depends upon the capacity for symbolic thought and social learning. Symbolic meaning results from a cognitive process whereby an object acquires a connotation beyond its instrumental use (Nasar 1989; Lang 1987). When looking at the built environment, one can believe that buildings should have a congruent cultural expression of what people understand and expect from them in order to be part of a social sustainable system.

Doxtater (2005) following the ideas of JJ Gibson, defined cultural expression as an experiential category as "people attaching spatial and object associational/symbolic meaning in a setting for some social purpose". The components of meaning can be described as cognitive, motivational and affective (Connor & Chamberlain 1996; Reker & Wong 1988). In the cognitive component, people interpret their experiences in life and develop understanding and beliefs. The motivational component includes values and goals as well as behaviors. Value systems dictate which goals people choose. The pursuit and attainment of chosen goals leads to a sense of purpose. The affective component comprises the feelings of satisfaction and fulfillment people get from their experiences or from the achievement of their goals. These structural

components are interrelated and common to people's experience of meaning. Rapoport (1988) theorizes three levels of meaning: (1) High-level meanings are related to cosmologies, world views, philosophical systems, etc.; (2) Middle-level meanings, also called latent functions, are those such as identity, status, wealth, power, etc.; and (3) lower-level, everyday meanings are, for example, privacy, accessibility, seating arrangements, movement, etc., which are also called manifest functions (Zwarts & Coolen 2006; Rapoport, 1988). While not speaking directly to the issue of cultural imagery, per se, Henry Sanoff (2001) considered the physical environment as the second teacher, "School space has the power to organize and promote pleasant relationships between people of different ages, to provide change, to promote choices and activities, and to spark different types of social, cognitive, and affective learning. These settings mirror the ideas, values, attitudes, and cultures of the people within it" (p. 2).

Yet when looking at many highly rated green buildings and comparing them with other conventional buildings that have similar function and size, sometimes one has difficulty in distinguishing the two as in the image of the Solaire LEED Residential tower in New York, Figure 1. Others have different features that give people a clue of their green properties as in the image of California Academy of Sciences, Figure 2. One can list many features and systems added to green buildings in order to make them green, however, they tend to appear or disappear as visual elements in the building image somewhat accidentally according to the architects and building designers' point of views.



**Figure 1. The Solaire, LEED Gold residential (on right) blended with the image of conventional buildings at the Battery Park City, New York. By Gryffindor, 2010, retrieved from Wikimedia commons, [www.wikimedia.org](http://www.wikimedia.org)**



**Figure 2. California Academy of Sciences, LEED Platinum museum distinguishable by its green roof from other conventional buildings in San Francisco.**

### **Davidson Elementary School**

The school is located at 3950 E. Paradise Falls Drive, Tucson, AZ. Davidson Elementary School (DES), the first LEED certified school in Tucson and one of the first group of green schools in Arizona, has a story in this regard; the school was designed as a green school by a local architect in collaboration with the principal of the old school, teachers and parents. The old school suffered badly from mold and was torn down when they moved in to the new building in 2006. The new buildings were certified by the US Green Building Council in 2007, highly satisfying all collaborators as well as the students (Beal 2008). The accomplishment was celebrated by the state government and the media as well. One of the intentions of the design team was that the building be used as a pedagogical tool for illustrating “green building” technology to the instructors and students; the architect created interpretive elements around some of the green features that show people how green building designs work in order to be sustainable. The circumstances lead to the green building here, makes DES a good case study for examining the cultural meanings of the new green features to laypeople.

### **General design of the setting**

DES setting is organized into nine buildings; Administration and Library buildings in the north east of the setting, multipurpose room (cafeteria) in the east, a classroom and restroom buildings in the north, three classroom buildings and another restroom building in the south as shown in the general layout, figure 2. The classrooms are designed to open directly to the playground with external walkways partially protected with shades on the southern walls, while in other orientations the classrooms’ doors open directly to the playground without protection. These shades carry the photovoltaic panels oriented to the southern direction. As seen in Figure 3 and 4, the school is composed of one story building with gray concrete walls.



**Figure 3. Davidson Elementary School general layout.**



**Figure 4. Davidson Elementary School external front view.**

### **Classrooms**

The classrooms are designed to catch the natural light from north facing skylights and limited number of windows at different heights from the classroom floors; neither windows nor skylights have operable coverings to control the amount of natural light. The HVAC system components, i.e., Ducts and air handling equipment, as well as the heat insulation, which is made from recycling denim, are exposed inside the classrooms. The HVAC system supply is made as a perforated sack; it has been intentionally designed as a didactic tool to show students how it inflates when the system is on and how it deflates when the system is off. Colored concrete flooring and white painted walls are the main finish for most of the spaces except some classrooms that were painted in different colors by the classroom teachers. Every classroom has two different space heights from inside; half of the classroom has a flat ceiling with normal height about 9 ft, the other half has a sloped roof up to 16 ft height to

accommodate the northern skylights right on the edge of the flat ceiling, as shown in Figure 5.



Figure 5. Typical classroom at Davidson Elementary School.

## Method

Similar to Fisher (2007) who studied the schools of architecture as building type and classified them according to the configuration of the plans, the first stage of this study explores the elementary schools as type based on the images of the buildings in Tucson Arizona. A simple questionnaire has been used to survey people's recognition of building types and architectural styles generally and specifically to elementary school buildings. Thirty respondents, 17 female and 13 male, were interviewed to examine their understanding and interpretation of building styles and types in Tucson. The questionnaire started with open-ended questions such as: how many building styles do you know of? Can you recognize the function of the building from its external image? Can you recognize the differences between shopping malls, elementary schools, factories, hospitals or office buildings from the images of the buildings? The significance of this survey was to portray a cultural image for the conventional elementary schools in Tucson.

Unlike Nasar (2007) in his post occupancy evaluation of schools of architecture, while he separates the responses of passersby from the responses of building's inhabitants towards the images of the buildings, the second stage of this study does not differentiate the responses towards the images of DES based on the perception from outside and inside the building. A questionnaire has been used to survey laypeople responses to the images of the new green school. The questions were designed to reflect the interpretation of the images of green building features based on different experiences. Different types of laypeople were interviewed such as teachers, staff, students and parents. Answers to two questions are being sought: 1) What are the meanings of green features in this school in a truly cultural context, and 2) What are the implications of these realities on the assumptions architects and researchers have about sustainable design?

Researchers have contested various methods in studying the cultural image of objects and buildings. Some use statistical methods relying on questionnaires as Mihaly and Eugene (1981) did in their study about the meaning of things which explored the relation between domestic symbols and the self. Others use photographic elicitation with individual interviews such as Doxtater in his study of La Paz residence hall at the University of Arizona (Doxtater 2005). The



**Figure 6. The courtyard between the classrooms at Davidson Elementary School.** It shows the grey color of the buildings, the external walls of classrooms on right-hand side, and the doorway system covered by the photovoltaic panels on the left-hand side.

present ethnographic approach was undertaken as an efficient approach to explore the cultural dimensions of a physical setting related to a small-scale group. The evaluation relies on individual interviews, a focus group method with some photographic elicitation, and walkthroughs to facilitate respondent recall in the actual setting. Intensive interviews held with 19 teachers, 3 staff, 15 students and 10 parents. Each interview takes about 20 to 35 minutes. After attempting to use the same method with the students, the author found that a focus group approach was more fruitful; it encouraged them to talk and express their knowledge and feelings.

The typical interview started with demographic information such gender, age, ethnicity, and how much time they spent in the school (the aim was to interview people who spent at least one year in the new facility). Additional background information was collected such the respondent's role in the school and how the new building design helps them to succeed in their roles. The questions escalated to identify the respondent's preferences: Do you like the architectural image of the building? Have you ever discussed green issues related to the buildings with your colleagues? What would you say when someone unfamiliar with the school asks you to describe it for him? All the interviews were tape recorded, as were discussions during the walkthrough.

## Results

The initial survey shows that the respondent's knowledge about architectural styles is very limited. Differently, it has been found that respondents have a strong argument about building types. They confirmed that there are many cues supporting their responses about the building types, such cues include the image of the landscape around any building, the area of parking lots, the overall design of the façade and windows, the size of the building, and some other architectural elements such as chimneys above the factories and bell towers of the churches. The respondents tend to share the perception of these building elements as determinants for their expectations about building functions when they see them from outside.

Although the main objective of the initial survey was to develop the questions for the ethnographic interviews, the responses uncovered some dimensions related to people's recognition of green as a new building type. The interviewees confirmed that there is no existing type or style for green buildings while the recognition of green features is a reality for everyone. Some building features indicate saving energy and being environmentally conscious such as using photovoltaic arrays and water harvesting systems. These elements signified the meaning of "sustainability" to some interviewees. The ethnography, at a later stage, confirmed some of the results of the initial survey.

### Early acquisition of cultural meanings of green features

Ninety percent of the respondents at DES are merely aware of the exposed visible green features, being largely unaware of much less apparent sustainable aspects of the setting. The visible green features people know of in the setting are: windows' design, recycled denim insulation, photovoltaic panels, concrete flooring, and concrete walls. The respondents were not quite sure about some other issues such HVAC and water harvesting systems that they believe they have some flaws due to construction quality. Regarding the laypeople's awareness of green features in the setting, one of the questions is: How many green features in the school buildings do you know of? A teacher explained "Solar panels, shredded Blue jeans in the ceiling, cement floors, northern skylight", another teacher said "I know that the windows have something to do

well, those are recycled jeans in the ceiling, and then the materials used in building like concrete walls". A 4th grade student explained, "I just thought the solar panels are here, you see that roof". One of the parents said "just solar panels up on the roof", another parent explained, "there are the solar stuff and blue jeans".

The way the people acquired their knowledge about the green features is unclear, some got the information from the school's website, others knew from the school's principal and most of respondents have been informed through casual conversations and discussions with colleagues and visitors. This was evident when asked specifically about particular green features of the building; how did you get this information, about the green features of the building? One of the staff said "Hmm, how did I know, everybody knows, probably from the principle, well when I applied for this job I went online so I guess TUSD website", the custodian added, "I was informed of that by the principal when I been interviewed for the position". A parent said "Well, we just looked up on the internet to know what they meant by a green school and Ms. Tracy was our son's teacher last year and she gave us more insight on, you know about the blue jeans", A 4th grade student said "I just thought that, and from my grandma and grandpa". Another 4th grade student said "I knew that from my friend Britney".

Although the comments show that people didn't recognize the greenness of the building until they were informed, they have shared the perception of some building elements as signifiers for the notion of green. This perception is based on informal contextual conversations and or from the media such as the Internet, TV shows or magazines. As the questions escalated, three other issues have been raised, and were repeatedly mentioned by most of the respondents: 1) the images of classrooms' doorway system, 2) the novel image of the exposed insulation and HVAC system components on the ceiling of the classrooms, 3) the image of the classrooms' little windows that are completely different from the large windows everyone used to have in conventional schools.

### **Conflict between the images of Tucson traditional hallway system and images of DES**

Traditional elementary schools in Tucson Arizona have indoor hallways or corridors around courtyards as doorway systems to circulate people between the classrooms. In contrast, the architect of DES didn't follow the more typical pattern, distributing the classrooms in four separate buildings. All classrooms open their doors directly to an outdoor space, Figure 7, a partially covered sidewalk linking the classrooms of each building. Most of the respondents repeatedly mentioned that they are convinced that the buildings don't have traditional indoor hallways to save square footage due to the limited budget, and to save materials and natural resources for greening purposes. However, interviewees consider having traditional hallways as very essential for making socially worm environment between teachers, students and staff while protecting them from the hot climate.

A teacher said "It is a building that we chose not to have the indoor hallways, it was more expensive to put indoor hallways in because you have to heat those hallways and it also took away some of the square footage of the school". Another teacher explained, "Like I said, I miss kind of walking down to hallway, in closed hallway. I cannot explain it. We just kind of feel isolated at times. Doors open into the hallway, it feels like more of a community, like you are aware on what is going on across the hall in that classroom". Other respondents miss having unconditioned corridors around closed courtyards like some old schools in Tucson Arizona. These old schools were configured around a courtyard with lush trees that mitigate the outside weather conditions.

A teacher said "and like right outside mine, in the old school, was breezeway so you know there was a covered area and exposed to the weather and then there was like a square area that was open. We had trees growing, we had bushes growing and it was on the inside of kind of the building, but then again it was

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Figure 7. The external doorway system linking classrooms at Davidson Elementary School.

*covered so that you could walk without having to get wet, so I do not mind not having the indoor hallways”.*

*Just you look around and this looks unfinished, you know, looks incomplete, it has the feel to it like you just moved in to a house and you are unfinished or unrest and you cannot rest*

### **The novel image of the exposed insulation and HVAC system components on the ceiling**

Laypeople interpreted the image of the exposed insulation materials on the ceilings, the white color of the classrooms, and the grey color of the exposed concrete walls as part of the building's greenness. They believe that the architects intentionally made them to saving energy and preserving natural resources. Almost half of the teachers changed the white color inside their classrooms, either by paint or by covering them with colored papers in order to get rid of this “cold” feeling as they mentioned in their responses. A different interpretation was given for the exposed unfinished ceiling and HVAC ducting system shown in Figure 8, where some considered the image to be of an “unfinished” space or building that was under construction or didn't have enough budgets to be completed. Other respondents consider this image as an “industrial look” and unlike an elementary school. A few believed that this look is somehow an extension of a fashionable trend like some new restaurants and discotheque spaces.



**Figure 8. The typical image of HVAC system ductwork and ceiling insulation exposed in every classroom at Davidson Elementary School.**

*A teacher said “At first, it was like yea, that is cool but now it is like kind of yucky to have things out like that, I mean I kind of wish that they could have been hidden a little bit more under a dropped ceiling”. Another teacher explained, “when I first really saw the buildings it was cold, not cold but you know it was a cold place, because of the color on the walls”. Teacher added, “just you look around and this looks unfinished, you know, looks incomplete, it has the feel to it like you just moved in to a house and you are unfinished or unrest and you cannot rest”. A teacher explained, “Kind of industrial, I mean I know that it is not expensive to do a green building, but it kind of reminds me of like they did not want to pay to put the covering over the unfinished ceiling”.*

### **The image of little windows and feeling of being in a prison**

One of the features that negatively affected the exterior and interior image of the buildings is having small windows in classrooms' concrete gray walls. Most of teachers are dissatisfied for not having larger windows in the classrooms as in typical elementary schools in Tucson. They frequently use the sills of the large windows to put the kids' plants while the large area of glazing always let them feel connected with the outdoor environment. The current DES building



**Figure 9. Windows from inside the classrooms.** Teachers cover the windows in order to get rid of the negative interpretation.

has a few small windows at the regular height from the floor, Figure 9, which neither allows children nor teachers to have a typical view to the outside environment. Compounding the annoyance is the reported fact that people use these small windows to look into the classroom from outside. While the architect designed the north facing skylights to provide natural lighting to the classrooms, people relate the image of the resulting space without many ground level views to being in a prison. Some teachers covered these windows with dark color paper to prevent people looking in from outside, and getting rid of the feeling of being watched from outside a prison cell. Others put student's artworks on the glass of these windows for the same reason.

### **The impact of cultural image of Building's green features on users' belief in sustainability**

A direct question has been asked at the end of each interview; do you think after your experience in this school that we should keep building green schools? Although the negative interpretation exists, the majority of the answers were "yes", and the reason is the potential local and global benefits of the green structures. In contrast, the school's principal said, *"we should distinguish between a green school and the school that has a green building because Davidson is not a green school just because it has green buildings. Nothing affected the school due to having these buildings; all the activities here in the school such as recycling programs and attitudes towards saving energy come from people who are working in the school, there are many other schools greener than Davidson while having conventional not LEED buildings"*.

### **Conclusion**

Ecological design is a large concept that joins science and the practical arts with ethics, politics, and economics (Orr 2004). Yet this enterprise has yet to reach its climax through an understanding of people's cultural interpretation of green features in a green built environment. As this ethnography shows, a negative interpretation appears with these best of sustainable intentions. Even though the recommendation coming out of the architect's own post occupancy evaluation is to assemble an informational "operators manual" for the students, teachers, parents, and staff, who may not be aware of the design intentions (POE done by the designer on 2009), this may not be enough. Much more ethnographic research on the cultural image of green buildings is needed to gauge the extent of how architects and technical people working in these projects can better predict, accommodate, and even change deeply held cultural beliefs about our buildings. These processes can then be placed in the larger context as defined by B. Brown et. al. (1987) who define social sustainability as "the continued satisfaction of basic human needs; food, water, shelter, as well as higher-level social and cultural necessities such as security, freedom, education, employment, and recreation". The users' socio-cultural background in sustainable buildings should be accommodated as part of building's sustainability.

Davidson Elementary School Buildings offers limited use of symbolic meanings to foster belief about sustainability; at the same time it conveys clear negative meanings to laypeople, obviously hindering a possible sustainable relationship between people and environment. The school buildings have never been used as a learning tool, while as mentioned in the architect's POE, one of the intentions of the design team was that the building be used as a pedagogical tool for illustrating "green building" technology to the instructors and students (Architect POE 2009). The paper shows a clear link between green building images and its visible features as green buildings, this link appeared in the respondents' answers, the verification of the nature of this link and the possibility of using it in supporting a belief system about sustainability needs more ethnographic studies in green settings.

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