



George Srour, the Director of [Building Tomorrow](#), the international non-profit organization constructing schools in Uganda, told us that in the rural areas, when a building is considered beautiful, people say it looks “smart”. Our team felt that this was a perfect metaphor for our design for the Open Architecture Classroom Challenge. This project is about “smart” buildings, but it is also all about the power of education to help children build their capacity to be “smart.” Our team worked toward this goal not only for the children in Uganda, but we also deeply engaged a group of 1st and 2nd grade public school students as architects and advisors in the design process as well. Our SMART approach to the architecture includes the following five principles:

Sustainable:

We created an environmentally-conscious design using low-impact resources in harmony with the climate and landscape of rural central Uganda. The site design incorporates many of the principles of permaculture, including water capture and retention through cisterns and swales; a “wood lot” of quick-growing acacias or jack trees, to be harvested for firewood; an outdoor amphitheater using the “cob” building technique of sculpting clay, sand, straw, water and earth into artful seating; and careful integration of indoor and outdoor spaces to create more learning opportunities beyond the walls of the classroom.

Minimal:

Our fundamental yet elegant design, features basic elements and materials that are within the budget of Building Tomorrow and meet the clearly articulated needs and practices of the Ugandan educators. This building can be constructed by relatively unskilled local people using a small palette of available materials (brick, cement, steel, some treated wood, corrugated tin) Additionally, we created a module that can be easily understood and replicated in varying environments.

Adaptable:

Our school building features flexible architecture that allows for multiple configurations when expanded into a larger campus master plan. The simple module can be multiplied, combined or organized to respond to the special needs of a site. It can be configured to maximize rainwater collection; to take advantage of prevailing winds; to protect from sun exposure; or to create special interstitial spaces. This can be achieved by simply rotating the openings, or joining classrooms together back-to-back. In so doing, each school can create its own unique look.

Responsive:

This design matches the needs of the rural Ugandan community as articulated in the project brief, and in the conference calls with Building Tomorrow. We made some

modest, incremental changes to the current building practices, using the given budget, the palette of available materials, and the known skills of local builders. We pushed the boundaries in some strategic ways: truss design to allow light; ventilation in brickwork; stronger indoor-outdoor connections, and attention to site design. Taking advantage of the local vocational training programs to create artful welded steel window grates and doors.

Thoughtful:

Starting in February, our design team (three architects, a landscape architect and a graphic designer) deeply engaged forty 1st and 2nd grade public school children and their teachers in the design process. Our curriculum, which is outlined in the Student Feedback section of this submittal, was extraordinarily participatory, and resulted in a design proposal that reflects meaningful input from every student.

CURRIKI ~~Lesson 3: SUSTAINABLE BUILDING~~

Introduction:

This lesson plan will cover key concepts of ecological building, resource conservation, energy consumption (building construction and building lifespan), and material lifecycle. Your goal is to get students thinking about where buildings come from. Develop the understanding that building construction and building use consume huge portions of the world's natural resources.

Group Size: Any

Learning Objectives:

- Introduce key vocabulary in sustainable architecture
- Engage students in a dialogue about where buildings come from; the energy consumed in production and in use, and waste management in building demolition.
- They should be thinking about what this means to their future classrooms.

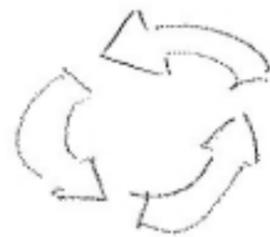
Guiding Question:

- Why does conservation matter?
- What does my classroom design have to do with sustainability?

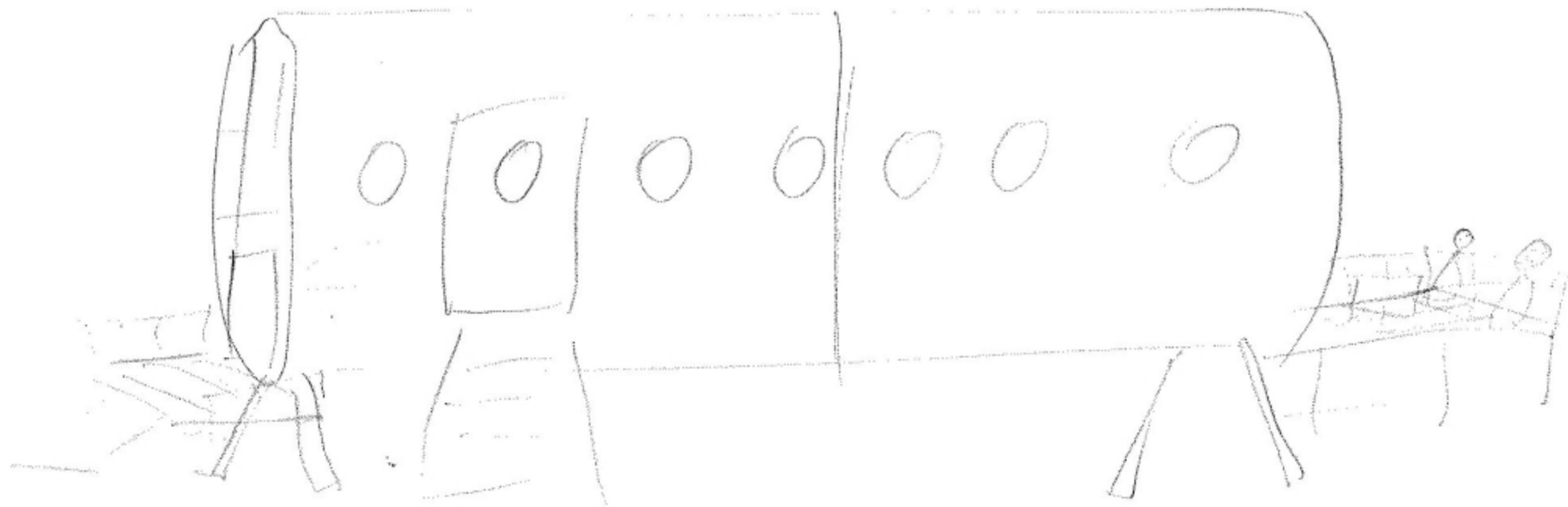
Results

The Children choose to have an environmentally safe building by having the sun and air the most important features. Although this sounds simple, these two characteristics are what make the classroom very replicable because it is simple to build, keeps cost low, and most importantly it is environmentally safe in many ways. The students ideas where implemented through how the project can be sustainable and environmentally friendly. They also had say on the design and color. The following are some pictures the students made. Also, attached in the project (however not on the Currki file), is a video of what the students and their ideas.

recycle



airplane



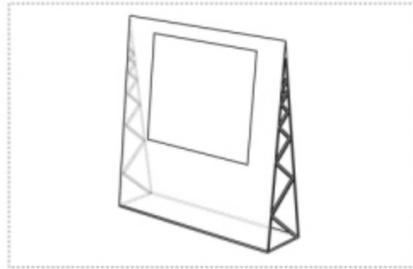
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BLACKBOARD/STORAGE UNIT

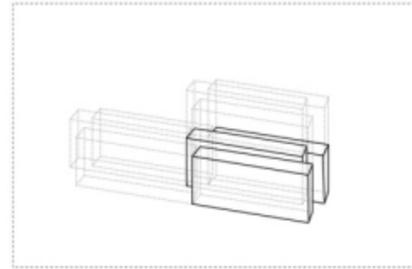


Plywood structures are a cheap solution to providing partitions to classrooms. They offer good acoustic and thermal insulation. Insulating material sandwiches between the boards can make them more effective.

\$ 17.02 / Rs. 800 per unit

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NOISE WALL

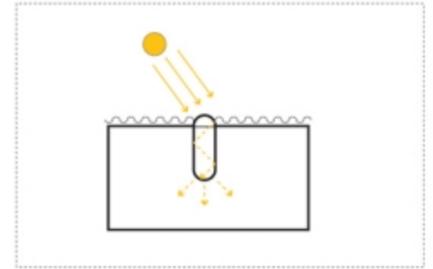


As part of a holistic fire and noise strategy this ISSB wall is a simple and cost effective solution for internal partitions.

\$ xxx / Rs. 10 per sqm

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LIGHT PIPES हल्की पाइप्स



Light tubes, also known as light pipes, use a high reflectance duct to channel the light from a skylight down to a diffusing lens in the room. These may be advantageous in deep roof constructions.

हल्की ट्यूबों भी काश पाइपों के रूप में जाना, एक रोशनीदान से नीचे के कमरे में एक diffusing लेंस करने के लिए रोशनी चैनल के लिए एक उच्च reflectance नली का उपयोग करे. ये गहरी छत के निर्माण में फायदेमंद हो सकता है.
\$1600 / Rs. 75504
15, 530 mm 4m long light pipes

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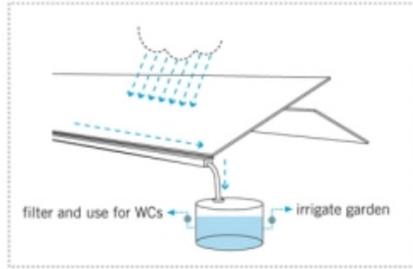
HOW TO USE

In order to communicate design changes to all the stakeholders involved a series of cards, each with a design feature and their relative cost have been annotated, these can be used to trigger a consultation process with students, teachers, parents, consultants, and contractors. The aim is to facilitate communication and consultation into the process. In addition with so much variation between each school and the condition of the building, for retrofitting this process can deliver a 'best fit solution' not just in terms of what the community wants but what is most applicable to a building type.

NOTE: COSTS ARE INDICATIVE IN MOST CASES

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RAINWATER HARVESTING

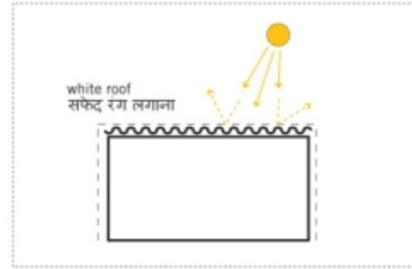


Rainwater harvesting can provide drinking water, domestic water, water for livestock, water for small irrigation and a way to increase ground water levels.

\$ 313.61 / Rs. 1500 per unit
sufficient for one classroom

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COOLING STRATEGY a

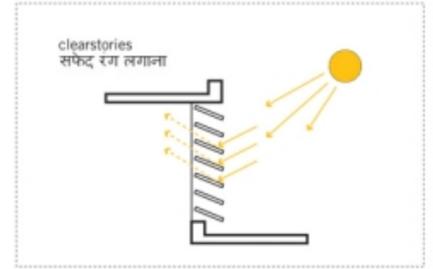


Minimize the amount of solar radiation absorbed on the outside of the building which can be transmitted through the walls and roof inside.

\$ 0.03 / Rs. 1.5 per sqm
\$12 / Rs. 591 for 400 sq m (roof of school 1)

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DAYLIGHTING STRATEGY a

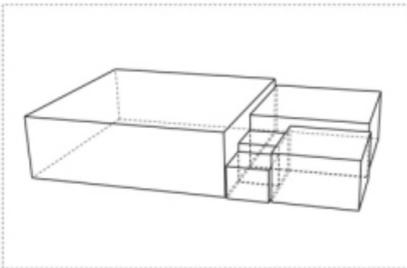


Clearstories may allow direct view of the sky and can bounce a great quantity of daylight and can control direct sun and vision.

\$ 2 / Rs. 0.04 per sq m
50 unit for school 1 and 60 for school 2

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FURNITURE BLOCKS



As part of the pedagogic strategy to providing alternative teaching environments and storage space this combines both in one unit minimizing material waste. Simple plywood boxes can be painted to add colour and vibrancy to the classrooms.

\$ 21.28 / Rs. 1000 per set of five

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PLAYGROUND GRAPHICS

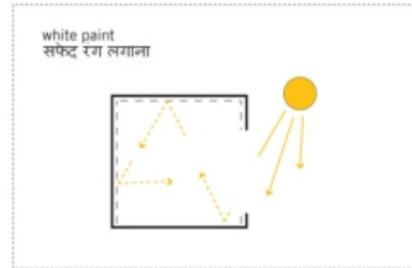


An economical way to create a dynamic and child friendly environment a stencil set with floor graphics is provided. These can be maps, words, letters, the alphabet, games or other graphics.

\$ 470 / Rs. 10 per unit
reusable and is a one off cost for stencil

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LUMINOSITY

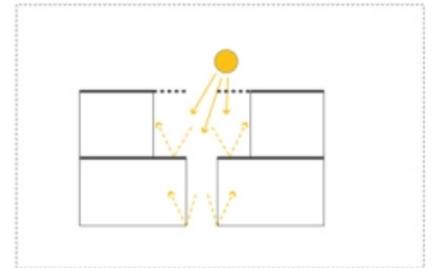


Increase daylighting in classroom by painting walls white which reflects light.

\$ 0.03 / Rs. 1.5 per sqm
\$12 / Rs. 591 for 400 sq m (roof of school 1)

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LIGHT WELL / CORRIDOR

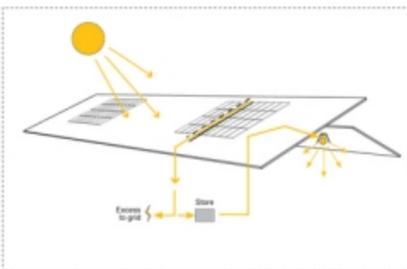


Clearstories may allow direct view of the sky and can bounce a great quantity of daylight and can control direct sun and vision.

\$ 25k / Rs. 1174995.2 per unit
for school 1 refurb

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SOLAR POWER

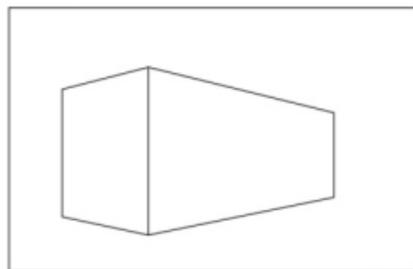


India is both densely populated and has high solar insolation, providing an ideal combination for solar power in India for the many areas that aren't linked to the electricity grid.

\$ 0.31 / Rs. 20 per unit
more than one unit recommended

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DISPLAY BOARD

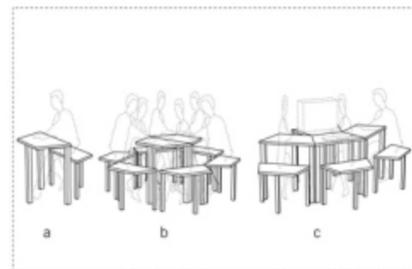


As part of the scheme to introduce a store front to the schools this simple and economical display board can be used to not only show art work but can be placed to focus views from outside towards the main highlight technology and computer room.

\$ 0.31 / Rs. 20 per unit
more than one unit recommended

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FURNITURE 1

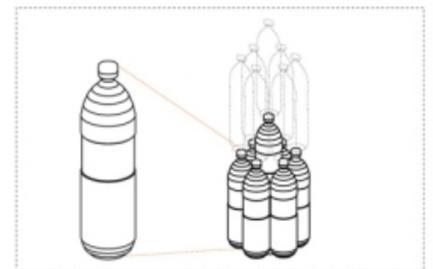


Modular table and chairs that can be easily re-arranged facilitating flexible and adaptable learning environments emphasizing alternative working from individual (a) to groups (b) and technology based (c).

\$ 20 / Rs. 940 per chair and table

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PLASTIC BOTTLE PARTITION

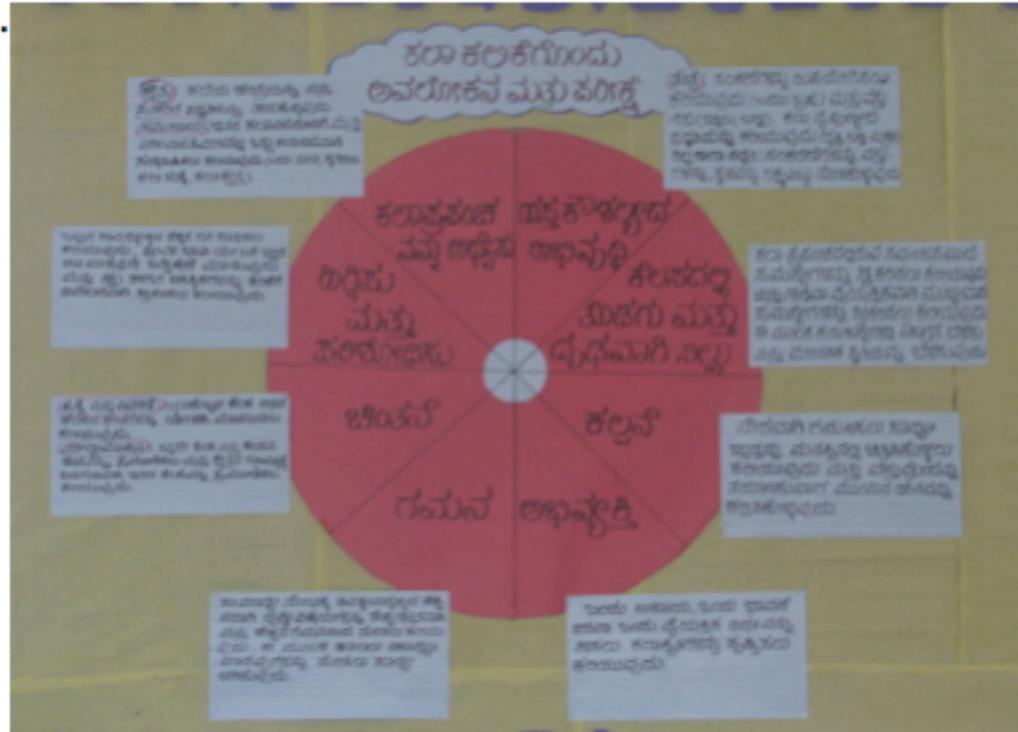


This opportunity for free partitions and other types of furniture that can be made out of recycled or found material is just one of many ideas to appropriate and reuse materials.

\$ 0.00 / Rs. 0 per unit
made from recycled and found material

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Habits of the Mind that students developed through the entire process.



rainwater catchment system with solar panels and cut out for garden space



the critique process and rainwater catchment system with movable fins



gathering of the final jury with students and facilitators